

PLAN APPROVAL APPLICATION



Philadelphia Energy Solutions Refining and Marketing, LLC.
(PES).

*Plan Approval Application Package for Heater Firing Rate
Increase*

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Environmental Resources Management
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Philadelphia Energy Solutions Refining and Marketing, LLC (PES) owns and operates a petroleum refinery in Philadelphia, Pennsylvania. The Philadelphia Refinery (Refinery) consists of multiple processing areas, the Girard Point Processing Area (GP) near the Platt Bridge, the Point Breeze Processing Area (PB) located near the Passyunk Avenue Bridge, and operations at Marcus Hook. The Refinery is made up of a number of processing units that are employed in the overall process of converting crude petroleum and other hydrocarbon feed stocks into finished hydrocarbon products and petrochemicals. Products include gasoline, home heating oil, diesel fuel and others.

PES is submitting this Plan Approval application¹ to request approval for increase in the firing rate of eight target process heaters at the Refinery to facilitate increased production as a part of a strategic plan to shift crude oil refining operations to GP and PB and away from Marcus Hook.

PES submits this plan approval to increase the firing limitations of the eight target process heaters and to raise refinery crude feed and product rates by proportionate amounts in order to increase production and thus offset decreases from the shutdown of Marcus Hook operations. In fact, this plan approval includes application of emission netting credits (emission reductions) that result in overall net decreases for certain pollutants from the combined Philadelphia and Marcus Hook operations. Specifically, following this plan approval, there will be an **estimated net decrease** in emissions of 50.5 tons per year (tpy) of nitrogen oxides (NO_x), 69.7 tpy of carbon monoxide (CO), and 3.5 tpy of fine particulate matter (PM_{2.5})².

All Refinery processing units rely on the combustion of refinery fuel gas (consisting of a combination of refinery by-product gas and natural gas) in direct-fired process heaters and steam-producing boilers to provide the energy needed to drive hydrocarbon conversions and product separations. By this application, the Refinery is proposing to increase the

¹ Sunoco, Inc. originally submitted this Plan Approval application on August 31, 2012. PES took over ownership of the Refinery on September 8, 2012. PES submitted an updated Plan Approval application that included corrected data and other revisions requested by Philadelphia Air Management Services (AMS) on November 13, 2012. PES submits this further revision to the Plan Approval application in response to further comments from AMS and Pennsylvania DEP.

² NO_x (tpy): increase = 123.2, credits applied = 173.7, overall reduction: 123.2 - 173.7 = 50.5
CO (tpy): increase = 129.6, credits applied = 199.3, overall reduction = 69.7
PM_{2.5} (tpy): increase = 5.4, credits applied = 8.9, overall reduction = 3.5

hourly firing limits on eight of its Philadelphia process heaters by an average of 19%. This will allow the Refinery to process, on average, more crude into finished products. Specifically, this change will enable the Refinery to offset reductions of intermediate streams feeding Refinery processes which were previously provided to the Refinery from the Marcus Hook operations.

This application lays out the emissions analyses and regulatory impacts from the permit limit changes requested for the eight target heaters, including impacts on ancillary operations at the Refinery.

1.1

SINGLE SOURCE DETERMINATION

On August 7, 2012, the Pennsylvania Department of Environmental Protection (PADEP) issued an amendment to the Title V permit for the Marcus Hook Refinery, and Philadelphia Air Management Services (AMS) issued an administrative order for the Title V permit for the Philadelphia Refinery recognizing that the two locations were a single source, for the reasons set forth therein. Sunoco's retirement on August 15, 2012, of the permits for operating crude refining sources at the former Marcus Hook Refinery implemented the plan to shift that production to the Philadelphia Refinery as a part of the shutdown of crude refining operations at the Marcus Hook Refinery.

1.2

PROPOSED PERMITTING

There are no physical changes to the eight target heaters as a result of this plan approval to increase firing rates. Moreover, the firing rates on the target heaters are limited by existing Reasonably Achievable Control Technology (RACT) requirements. To accommodate the increase in firing rates on the target heaters, PES is requesting revisions to the firing rate limits established as a part of the RACT permit.

This Plan Approval application package includes the following:

- Detailed plan approval descriptions (Section 2.0);
- Air emission changes associated with the plan approval (Section 3.0);
- New Source Review (NSR) applicability analysis (Section 4.0);
- Other Federal and State applicability analysis (Section 5.0); and

- Proposed permit conditions (Section 6.0).

Attachments to this Plan Approval application package include the following:

- AMS Plan Approval Application forms (Attachment A);
- Compliance Review History (Attachment B);
- Emission Calculations (Attachment C);
- Refinery Crude Throughput Data (Attachment D);
- Process Flow Diagrams/Site Location Map (Attachment E);
- BAT Cost Effectiveness Analysis (Attachment F);
- RBLCA and BAAQMD BACT Search Results (Attachment G);
- CO Cost Effectiveness Analysis (Attachment H); and
- RACT Cost Effectiveness Analysis (Attachment I).

PES submits this plan approval in order to allow the Philadelphia Refinery to accommodate this increased production. It is necessary to increase the firing limitations of the eight target process heaters to enable an overall production increase (e.g., raise refinery crude feed and product rates by proportionate amounts) and thus offset decreases in production from Marcus Hook operations.

The changes to the target heaters and the effects on ancillary refinery sources are discussed in the sections that follow.

2.1

TARGET HEATERS

This plan approval will not require any physical change to the target heaters. PES is seeking to increase the daily average firing limits (million British thermal units per hour [MMBtu/hr]) of the target heaters. The existing hourly firing limits and proposed hourly firing limits for the heaters as well as the proposed annual firing limits are shown in Table 2-1 below.

Table 2-1 Proposed Firing Limits for Target Heaters

Process Unit	Heater	Existing Hourly Firing Limit (MMBtu/hr) ¹	Proposed Hourly Firing Limit (MMBtu/hr) ¹	Proposed Annual Firing Limit (MMBtu/year) ²
GP Unit 137 Crude	F-1 Crude Heater	415.0	460.0	3,767,000
GP Unit 231 HDS	B101 Feed Heater	91.0	104.5	856,000
PB Unit 865 HDS	11H1 Feed Heater	72.2	87.3	699,000
PB Unit 865 HDS	11H2 Reboiler Heater	49.9	64.2	500,000
PB Unit 210 Crude	H101 Crude Heater	183.0	192.0	1,643,000
PB Unit 210 Crude	H-201A/B Crude Heater	242.0	254.0	2,172,000
PB Unit 866 HDS	12H1 Feed Heater	43.0	61.2	456,000
PB Unit 868 FCCU	8H101 Recycle Heater	49.5	60.0	480,000

¹ Compliance determined on a daily average basis.

² Compliance determined on a rolling 365 day basis.

2.2

SHUTDOWN SOURCES AT MARCUS HOOK REFINERY

Sunoco's retirement on August 15, 2012, of the permits for operating crude refining sources at the former Marcus Hook Refinery was contemporaneous with a filing by the Sunoco Philadelphia Refinery³ for emission reduction credits (ERCs) for the shutdown units listed below.

The shutdown sources at the Marcus Hook Refinery include⁴:

- Unit 12-3 Crude Heater H-3006;
- Unit 17-2A H-01, H-02, H-03 Heater;
- Unit 12-3 Crude Desulf Heater;
- Unit 15-1 Crude Heater;
- Unit 17-2A H-04 Heater; and
- Marcus Hook Cooling Towers including the 10 Plant A and B, 12 Plant North and South, 17-1A, 17-2, 17-2A and LSG towers.

The ERCs generated by the shutdown units listed above are included as contemporaneous emissions reductions. See Section 4.2 for details on the plan approval's contemporaneous emissions analysis.

2.3

UPSTREAM/DOWNSTREAM ANCILLARY UNITS

As noted earlier, this plan approval involves no physical modifications to any units at the Refinery and it does not debottleneck any ancillary units at the facility. However, the increase in the hourly firing rate limits sought for the target heaters is expected to increase utilization of upstream/downstream ancillary units relative to the 2010-11 baseline period.

PES has estimated the future potential incremental increase in crude throughput at the Philadelphia Refinery that is expected as a result of this

³ The Sunoco Philadelphia Refinery is now owned and operated by Philadelphia Energy Solutions Refining & Marketing, LLC (PES).

⁴ The sources shutdown listed here do not include shutdown sources listed in Consent Decree No. 05-02866 (Fourth Amendment, dated August 17, 2012). The sources listed in the Consent Decree are subject to specific requirements.

plan approval and the shutdown of the Marcus Hook Refinery. As discussed in Section 3, the emissions increases associated with the upstream/downstream ancillary units are based on potential incremental increase in crude throughput in the future.

Figures 2-1 and 2-2 at the end of this section show the overall process flow diagrams for the Girard Point and Point Breeze Processing Areas.

While this plan approval leads to some incremental emissions from upstream and downstream Refinery units (relative to the 2010-11 baseline period) which are accounted for in the emissions analysis contained herein, it does not “debottleneck” these units.

The Refinery is designed such that process units can run on a combination of feedstocks – those produced on site through distillation and other Refinery units – as well as imported feedstocks. Feedstocks are imported from a number of outside sources, which included, prior to shutdown of operating units, the Marcus Hook Refinery. The types and amounts of imported feedstocks vary based on a number of factors, including economic drivers and overall product demand.

This plan approval will enable upstream and downstream ancillary units to operate with a greater portion of their feeds from other materials processed at the Refinery, thus offsetting feed materials previously available from the Marcus Hook operations. Prior to shutdown of operating units at Marcus Hook, the typical imports of Marcus Hook produced components to Philadelphia operations included the following:

- Butanes – Marcus Hook provided about 1 thousand barrels per day (mbpd) of Butane/Butylene mix as incremental feed to the Alkylation units (Units 433 and 869);
- Naphtha – Marcus Hook provided about 7 to 12 mbpd of naphtha as incremental feed to the Reformer units (Units 860 and 1332) to make hydrogen and reformate. The volume depended on crude mix/naphtha content.
- Light Cycle Oil (LCO) – Marcus Hook provided about 10 mbpd of LCO as feed to Hydrodesulfurization units (Units 231, 866, and 859) to make ultra-low sulfur diesel.
- Benzene – Marcus Hook sent all of its benzene production (approximately 3 to 4 mbpd) as feed to the Cumene unit to make cumene.

On a less frequent basis, Marcus Hook would also send untreated cat gasoline to the Philadelphia Refinery for processing through the Low Sulfur Gasoline unit to reduce the sulfur content.

To support the conclusion that the increased firing of the target heaters will not debottleneck the ancillary units at the Refinery, PES reviewed historical Refinery crude processing rates (See Attachment D). This review demonstrates that there were several times outside of the 2010-11 baseline period when the crude processing rates at the Refinery were at or above the potential future crude throughput that is estimated to occur after the plan approval is issued, including a month when crude throughput was nearly identical to the potential future rates.

Accordingly, while the ancillary units will experience an increase in utilization as compared to the baseline period as a result of the plan approval, these units are not being debottlenecked because they have achieved these utilizations in the past.

2.4

SCHEDULE

PES seeks to implement this plan approval as soon as possible. Since this plan approval involves no physical modifications to any units at the Refinery, PES intends to implement the firing rate increases immediately upon permit issuance.

Figure 2-1 Girard Point Processing Area Process Flow Diagram

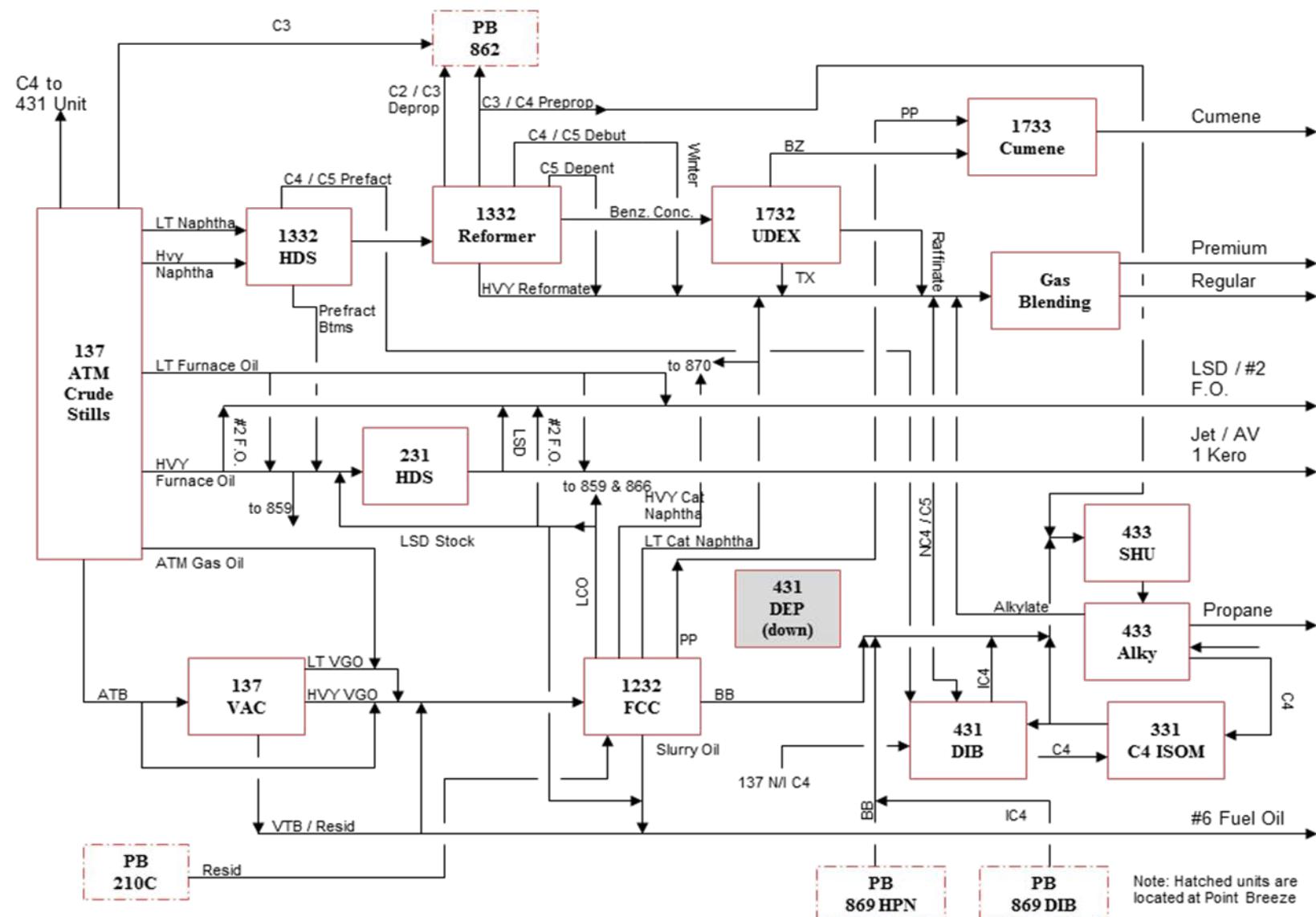
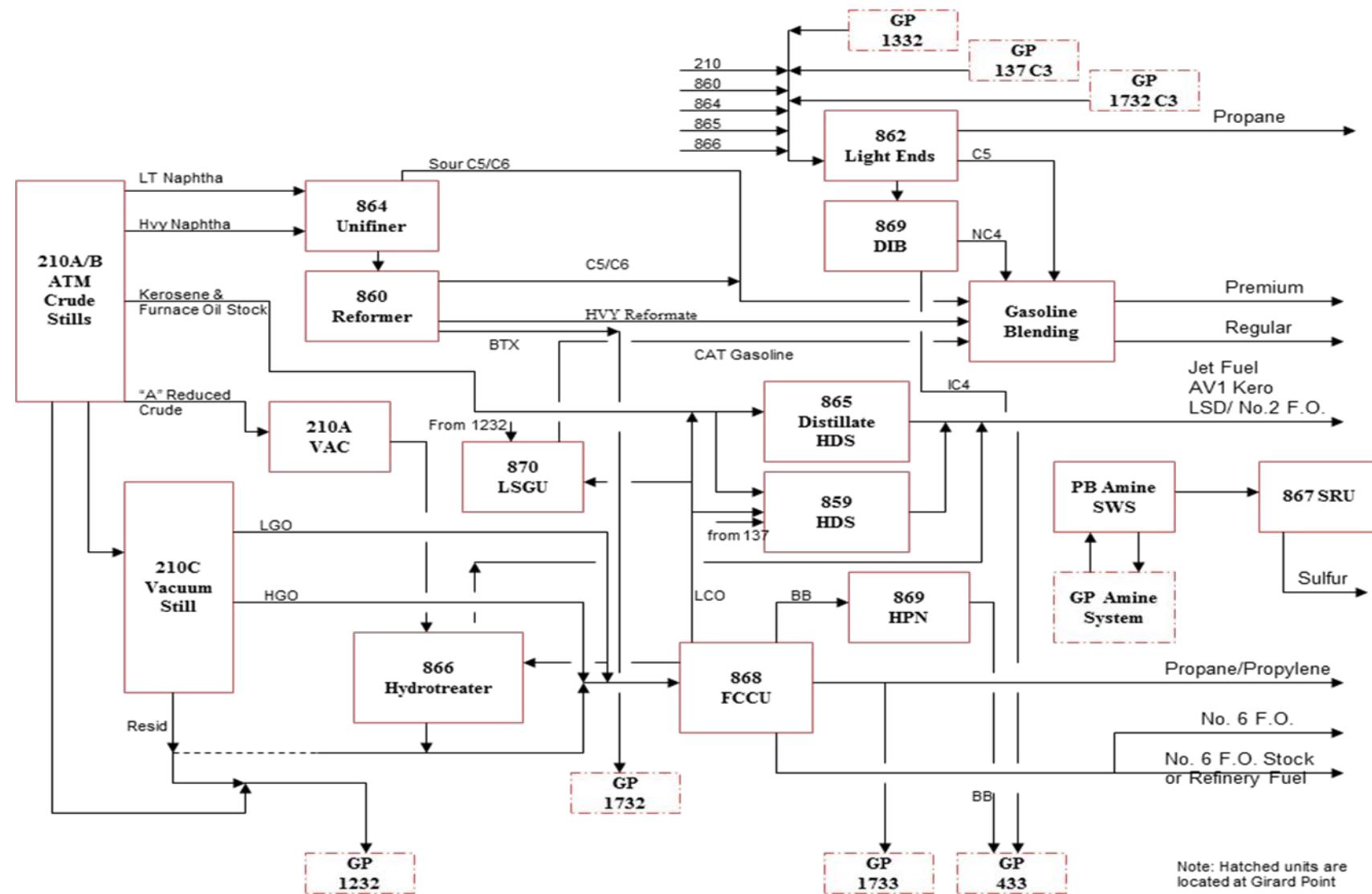


Figure 2-2 Point Breeze Processing Area Process Flow Diagram



In this permit application, the emissions from the target heaters and upstream/downstream ancillary units were calculated using the methodology described below.

Because this plan approval will not require any physical changes to the target heaters or any other upstream/downstream ancillary units at the Refinery, the emissions changes associated with the heaters are attributed to the incremental change in firing rates from historic operation during a defined baseline period to rates projected for the future. Similarly, the emissions increases associated with the ancillary units are attributed to potential incremental increase in crude throughput in the future as compared to the baseline period. As referenced earlier, the baseline period is January 2010 through December 2011.

The emissions changes from the emission units are calculated through a step-wise process. Initially, the emissions changes are calculated as the difference between the baseline actual emissions (BAE) and the future projected emissions. As per 25 Pa Code §127.203a(a)(4)(i) and 40 CFR §52.21(b)(48), BAE were estimated as the highest annual average during any 24-month period in the five years preceding the plan approval. Similarly, the projected actual emissions were estimated as the maximum emissions that the plan approval sources are projected to emit in any 12-month period during the five years following the plan approval.

In addition, as per 25 Pa Code §127.203a(5)(i)(C), 40 CFR 52.21 (b)(41)(c), and EPA guidance, the Refinery calculated and excluded any increase in emissions from sources affected by this plan approval that could have been accommodated in the 24-month period representing the baseline period, and that are unrelated to the plan approval⁵.

Table 3-5 shown at the end of this section shows the Total Heater Firing Rate Increase Plan Approval emission increases. Detailed emissions calculations for all target heaters and upstream/downstream ancillary units can be found in Attachment C.

⁵ USEPA, 2010. Letter from Gregg M. Worley, Chief- Air Permits Section, USEPA Region IV to Mark Robinson, Georgia Pacific Wood Products LLC, re: PSD Emissions Calculation and Demand Growth; 18 March 2010. EPA concurred with Georgia Pacific that the "highest demonstrated average monthly operating level during the baseline period" could be used as an approximation for the level the unit could have accommodated during the baseline period.

3.1

TARGET HEATERS

To calculate the annual emissions (tons per year) from the target heaters, the future annual firing rate must be established. All pollutant emission changes refer to the future annual firing rate as compared to the past actual annual firing rate calculated from the actual firing in 2010 and 2011. Note that the annual average hourly firing rate (MMBtu/hr) for the heaters is projected to be lower than the projected maximum daily average hourly firing rate (MMBtu/hr). Therefore, the projected annual average firing rates (MMBtu/year) are estimated assuming, for most of the heaters, that the future hourly firing rate will be the existing firing hourly limit plus 50% of the increase between the proposed short-term hourly firing limit and the existing hourly firing limit multiplied by the full 8,760 hours in a year.

This approach to setting the basis for the annual average firing rates reflects the reality of refining operations where operations can vary seasonally and in response to market demand and other factors. As part of this plan approval, the Refinery is proposing limits on the total annual firing rates (MMBtu/year). Thus, the annual emission changes associated with the plan approval reflect the difference between past actual emissions and future projected emissions based on total annual firing rates.

The sections below discuss the methodology for calculating the target heater emissions for this plan approval for each pollutant. Table 3-1 below shows the future projected actual emissions for each target heater.

3.1.1

Primary Pollutants VOC, PM/PM₁₀/PM_{2.5}, CO, and Lead

The Refinery used EPA AP-42 emission factors for volatile organic compounds (VOC), particulate matter (PM), particulate matter less than 10 microns (PM₁₀), particulate matter less than 2.5 microns (PM_{2.5}), carbon monoxide (CO), and lead for the target heaters. The EPA AP-42 factors are expressed as pounds per million standard cubic feet (lb/MMscf) of natural gas burned as fuel. Based on refinery fuel gas testing data, the Refinery calculated the EPA AP-42 emission factor as pounds per million Btu by dividing the EPA AP-42 lb/MMscf factor by the current higher heating value for refinery fuel gas for each heater. The future projected emissions are calculated using the future projected annual firing duty and the EPA AP-42 emission factors.

3.1.2

Primary Pollutant SO₂

This plan approval will allow for an increase in firing of certain target heaters; however, it is not expected to have an impact on the amount of sulfur in the refinery fuel gas, which is the only fuel for refinery heaters. Sulfur dioxide (SO₂) emissions have historically been estimated based on actual sulfur in fuel gas; however, the target heaters only became subject to refinery fuel gas sulfur limits required by New Source Performance Standards Subpart J for Petroleum Refineries in 2011. Therefore, for this plan approval, the 2011 actual SO₂ emissions and 2011 actual fired rates for each target heater were used to derive a heater-specific SO₂ emission factor. The future projected SO₂ emissions were calculated using the future projected annual firing duty and the heater-specific SO₂ emission factor.

3.1.3

Primary Pollutant CO_{2e}

The Philadelphia Refinery annually reports greenhouse gas (GHG) emissions in the units of carbon dioxide equivalents (CO_{2e}) to the EPA as required by the Mandatory Greenhouse Gas Reporting rule codified at 40 CFR Part 98. The GHG emission factors used for this plan approval were derived following the methods described in 40 CFR 98 Subpart C for General Stationary Fuel Combustion Sources, which includes an analysis of the composition of the refinery fuel gas being combusted for each heater. The GHG emission factor for each heater was derived from the emission factors in Subpart C and the higher heating value of the refinery fuel gas being used. The future projected CO_{2e} emissions for this plan approval were calculated using the future projected annual firing duty of each heater and the heater-specific CO_{2e} emission factor. This method is at least as accurate as the EPA AP-42 emission factor for CO₂ as this factor only reflects the combustion of natural gas.

3.1.4

Primary Pollutant NO_x

The methodology used to select the nitrogen oxide (NO_x) emission factors for the target heaters is described below. As seen below, because some of the heaters already have RACT permit limits, the Refinery used the NO_x emission factors used to derive those limits for those heaters as opposed to EPA AP-42 emission factors used in the annual emissions reports to AMS. The Refinery proposes to amend reported Emission Inventories submitted to AMS for 2010 and 2011, for heaters where the annual emissions used in this analysis are different from the emissions reported earlier. The NO_x emission factor used for each heater is discussed below:

- For the Unit 137 F-1 Heater, the BAE are the reported Emission Inventory emissions for 2010 and 2011 using Continuous Emissions Monitoring System (CEMS) data. The future projected NO_x emissions are calculated using the future annual firing duty and a NO_x emission factor of 0.123 pounds per million Btu (lb/MMBtu), which corresponds to the annual average NO_x emission rate shown in the 2011 reporting Emission Inventory.
- For the Unit 231 B101 Heater, the BAE shown in reported Emission Inventories are adjusted to recognize that this heater has a RACT NO_x emission factor of 0.122 lb/MMBtu. NO_x emissions for this heater for this plan approval are based on this same RACT limit and the future projected annual firing duty.
- For the Unit 865 11H1 Heater, the BAE was based on the RACT NO_x limit of 0.113 lb/MMBtu, which is lower than the EPA AP-42 emission factor used in the reported Emission Inventories, as the baseline emissions could not be greater than an applicable emissions limit. Future projected NO_x emissions for this heater for this plan approval are based on the RACT emission rate and the future projected annual firing duty.
- For the Unit 865 11H2 Heater, the use of EPA AP-42 emission factor was specified by AMS for use in the reported Emission Inventories. To be conservative, the Refinery used the same RACT NO_x limit for the Unit 865 11H1, which is greater than the EPA AP-42 emission factor, to calculate the BAE for the plan approval. The Refinery proposes to amend the reported Emission Inventories to reflect the higher emission factor of 0.113 lb/MMBtu for this heater. Future projected NO_x emissions for this heater for this plan approval are based on the RACT emission rate and the future projected annual firing duty.
- For the Unit 210 H101 Heater, the BAE was based on the RACT NO_x limit of 0.089 lb/MMBtu, which is lower than the EPA AP-42 emission factor used in the reported Emission Inventories, as the baseline emissions could not be greater than an applicable emissions limit. Future projected NO_x emissions for this heater for this plan approval are based on the RACT emission rate and the future projected annual firing duty.
- For the Unit 210 H201 Heater, the BAE was based on the average CEMS data for the years 2010 and 2011. The future projected NO_x emission rate is based on the permit limit for the heater of 0.03 lb/MMBtu. Future projected NO_x emissions for this heater for this

plan approval are based on the NO_x permit limit and the future projected annual firing duty.

- For the Unit 866 12H1 and Unit 868 8H101 Heaters, the BAE and the future projected emissions were established using the same approach as that used for the Unit 865 11H2 Heater.

Table 3-1 Future Projected Actual Emissions from Target Heaters

Target Heater	PM (TPY)	PM ₁₀ (TPY)	PM _{2.5} (TPY)	CO (TPY)	VOC (TPY)	NO _x (TPY)	SO ₂ (TPY)	Lead (TPY)	CO _{2e} (TPY)
Unit 137 F-1	1.2	1.2	1.2	12.7	0.8	19.6	0.6	7.6E-05	18,232
Unit 231-B101	1.3	1.3	1.3	14.0	0.9	21.2	0.4	8.3E-05	19,995
Unit 865-11H1	0.5	0.5	0.5	5.1	0.3	7.1	-0.1	3.0E-05	7,326
Unit 865-11H2	0.3	0.3	0.3	3.7	0.2	5.1	0.0	2.2E-05	5,260
Unit 210-H101	0.6	0.6	0.6	6.2	0.4	6.8	0.2	3.7E-05	8,853
Unit 210-H201	0.6	0.6	0.6	6.6	0.4	2.4	0.2	3.9E-05	9,468
Unit 866-12H1	0.9	0.9	0.9	9.9	0.6	13.7	0.1	5.9E-05	14,173
Unit 868-8H101	0.2	0.2	0.2	2.0	0.1	2.8	0.1	1.2E-05	2,808
Total Target Heater Emission Increases¹	5.4	5.4	5.4	60.1	3.9	78.7	1.3	3.6E-04	86,115

¹ The Refinery calculated the emissions from the target heaters that they were capable of accommodating in the 24-month baseline period and these are accounted for (subtracted from) future projected actual emissions shown in this table. See the Emissions Calculations in Attachment C for details.

3.2 UPSTREAM/DOWNSTREAM ANCILLARY UNITS

The increase in the hourly firing rate limits sought for the target heaters is expected to increase utilization of upstream/downstream ancillary units on an annualized basis as compared to that achieved in the baseline period.

PES has estimated the future potential incremental increase in crude throughput at the Philadelphia Refinery that is expected as a result of this plan approval.

The potential incremental increases in emissions from upstream/downstream ancillary units have been estimated by scaling the potential incremental increase in crude throughput as compared to past actual crude throughput rates during the 2010-2011 baseline period at the Refinery.

The sections below describe the emissions calculations for each type of upstream/downstream ancillary unit affected by this plan approval.

3.2.1

Ancillary Process Heaters and Boilers

Future emissions from the ancillary process heaters and boilers are calculated by scaling historical emissions from the ancillary units with the appropriate maximum expected crude increase. Specifically, crude heaters (Unit 137 F-2 Heater, Unit 137 F-3 Heater, and Unit 210 13H1 Heater) were scaled by the specific increases over the baseline sought for each crude distillation unit (approximately 23% at Unit 137 and 7% at Unit 210). All other heaters and boilers were scaled by the total potential incremental increase in crude throughput over the baseline. Accounting for different sizes of Units 137 and 210, this results in an overall facility crude processing increase of approximately 16%. All boilers at the No. 3 Boilerhouse are expected to increase utilization as a result of this plan approval, as are all of the ancillary heaters listed in Table 3-2 below.

Table 3-2 *Ancillary Process Heaters*

Ancillary Process Heaters				
Unit 137 F-2 Heater	Unit 1332 H-601 Heater	Unit 860 2H2 Heater	Unit 860 2H8 Heater	Unit 859 1H1 Heater
Unit 137 F-3 Heater	Unit 1332 H-602 Heater	Unit 860 2H3 Heater	Unit 864 PH1 Heater	Unit 870 H-01 Heater
Unit 210 13H-1 Heater	Unit 1332 H-1 Heater	Unit 860 2H4 Heater	Unit 864 PH7 Heater	Unit 433 H-1 Heater
Unit 1332 H-400 Heater	Unit 1332 H-2 Heater	Unit 860 2H5 Heater	Unit 864 PH11 Heater	Unit 1232 B-104 Heater
Unit 1332 H-401 Heater	Unit 1332 H-3 Heater	Unit 860 2H7 Heater	Unit 864 PH12 Heater	Unit 870 H-02 Heater

As discussed in Section 3.0 for the target heaters, the Refinery also excluded emissions increases that the ancillary process heaters and boilers were capable of accommodating in the baseline period and that are unrelated to the plan approval. Table 3-3 below shows the future projected actual emissions for the ancillary process heaters and boilers.

Table 3-3 Future Projected Actual Emissions from Ancillary Process Heaters and Boilers

Pollutant	Ancillary Process Heater and Boiler Emissions (TPY)
PM	5.4
PM ₁₀	5.4
PM _{2.5}	5.4
CO	56.1
VOC	4.2
NO _x	39.9
SO ₂	1.6
Lead	3.6E-04
CO _{2e}	91,901

3.2.2

Upstream/Downstream Ancillary Units (excluding Heaters and Boilers)

The emissions increases associated with other upstream/downstream ancillary units, except heaters and boilers, were calculated based on a projected increase in crude throughput over the baseline 24-month period. Similar to the ancillary process heaters and boilers, the emissions from other ancillary units were calculated by scaling the average crude throughput increase expected at each unit and the potential incremental increase in crude throughput. The appropriate scaling factor was used for each ancillary unit depending upon its location (Girard Point or Point Breeze) or whether it services the Refinery as a whole. Ancillary units include:

- Point Breeze, Girard Point, and Schuylkill River Tank Farm Wastewater Treatment Plants;
- Girard Point and Point Breeze marine vessel loading;
- Girard Point butane/polypropylene truck loading; and
- Sulfur recovery units.

As discussed in Section 3.0 for the target heaters, the Refinery also excluded emissions increases that the upstream/downstream ancillary units were capable of accommodating in the baseline period and which are unrelated to the plan approval. Table 3-4 below shows the future projected actual emissions for the upstream/downstream ancillary units.

Table 3-4 Future Projected Actual Emissions from Upstream/Downstream Ancillary Units

Pollutant	Upstream/Downstream Ancillary Units Emissions (TPY)
PM	0.04
PM ₁₀	0.04
PM _{2.5}	0.04
CO	13.4
VOC	6.3
NO _x	4.6
SO ₂	0.9
Lead	0.0
CO _{2e}	3,029

3.2.3 Unmodified Storage Tanks

Typical light hydrocarbon (gasoline) tanks emit 96% of their VOC emissions from breathing losses and only 4% from working losses. However, only the working losses are affected by throughput. Therefore, only the VOC working losses from unmodified storage tanks associated with this plan approval were scaled by the potential incremental increase in overall Refinery crude throughput over the baseline - approximately 16% ($0.96 + 0.04 \times 1.16 = 1.006$).

Note that no credits (emission reductions) are being taken for the cessation of processing Marcus Hook intermediates at the Refinery.

The future projected actual emissions for the unmodified storage tanks are included in the VOC emissions in Table 3-4 above.

3.2.4 Unaffected Upstream/Downstream Ancillary Units

The remaining sources at the Refinery are unaffected. That is, it is not appropriate to scale these sources' emissions based on expected changes in facility crude throughput because the emissions from these units are not rate dependent.

Specifically, such unaffected upstream and downstream ancillary units include:

- Leak Detection and Repair emissions;

- Cooling tower emissions;
- Flare emissions;
- Sampling system emissions; and
- Reciprocating internal combustion engine emissions.

3.3

TOTAL PLAN APPROVAL EMISSION CHANGES

The total future projected actual emission increases from the Heater Firing Rate Increase Plan Approval are summarized in Table 3-5.

Table 3-5 Total Heater Firing Rate Increase Plan Approval Emission Increases

Source	Pollutant (TPY)									
	NO _x	SO ₂	CO	VOC	PM	PM ₁₀ /PM _{2.5}	Sulfuric acid mist	Lead	HAP	CO ₂ e
Target Heater Emissions	78.7	1.3	60.1	3.9	5.4	5.4	0	3.6E-04	0	86,115
Ancillary Process Heaters and Boilers	39.9	1.6	56.1	4.2	5.4	5.4	0	3.6E-04	0	91,901
Upstream/Downstream Ancillary Units	4.6	0.9	13.4	6.3	0.04	0.04	0	0	0	3,029
Total Plan Approval Emissions	123.2	3.9	129.6	14.4	10.9	10.9	0.0	7.2E-04	0.0	181,045

PES must comply with all federal and state requirements applicable to this proposed plan approval. The existing units are subject to standards covered under the NSPS, MACT and state program requirements and will continue to be after the proposed plan approval. The existing facility is a major stationary source of emissions for all criteria pollutants and greenhouse gases; therefore, the plan approval is required to undergo a New Source Review (NSR) analysis. The Philadelphia Refinery is located in an area designated as moderate nonattainment for ozone; however, for NSR analysis, the area is treated as a severe nonattainment area. Additionally, Philadelphia County is designated a PM_{2.5} nonattainment area. It is designated as attainment for other criteria pollutants.

PES must evaluate the plan approval for applicability of the nonattainment NSR program for VOC, NO_x, and PM_{2.5} emissions, and applicability of the Prevention of Significant Deterioration (PSD) program for NO₂, SO₂, CO, PM, PM₁₀, lead, and sulfuric acid mist (SAM). In addition, PES is required to determine if GHG pollutants would be regulated as a part of the plan approval. The following sections provide the detailed regulatory analysis for the plan approval.

4.1***PREVENTION OF SIGNIFICANT DETERIORATION ANALYSIS***

The PSD regulations (40 CFR 52.21) are federal regulations that apply to new major sources and “major modifications” of existing “major stationary sources” located in attainment or unclassifiable areas for a given pollutant. The PSD regulations are enforced by PADEP in accordance with 25 Pa Code §127.81. The Philadelphia Refinery is a major stationary source, and a modification to the source that would result in a “significant emission increase” and a “significant net emissions increase” would trigger PSD applicability.

The PSD regulations define a major modification in 40 CFR 52.21(b)(3)(i) as any physical change in or change in the method of operation of a major stationary source that would result in a significant emission increase and a significant net emission increase of any pollutant subject to regulation under the Act. The regulation defines threshold levels of annual emission rates that constitute “significant increases” for a variety of pollutants. The PSD emissions analysis is performed as per applicable regulation in 25 Pa

Code §127.81 and 40 CFR §52.21. EPA takes the position that the PSD emissions analysis should be performed in two steps⁶.

4.1.1 *Plan Approval Emissions Analysis (Step 1)*

In Step 1 of the analysis, the emissions increases from all plan approval sources including the target heaters whose rates are increased and the ancillary units are calculated. The emissions calculation methodology was described in the earlier sections. As indicated in the Table 4-1 below, NO₂, CO, and CO₂e emissions for the proposed plan approval exceed the PSD threshold; therefore, PES performed a netting analysis over the contemporaneous period for these three pollutants.

Table 4-1 PSD Emissions Analysis (Step 1)

Emissions	Pollutant (TPY)							
	NO ₂	SO ₂	CO	PM	PM ₁₀	Sulfuric acid mist	Lead	CO ₂ e
Heater Firing Rate Increase Plan Approval	123.2	3.9	129.6	10.9	10.9	0.0	7.2E-04	181,045
PSD Significant Level	40	40	100	25	15	7	0.6	75,000
PSD Triggered (Before Netting Analysis)	Yes	No	Yes	No	No	No	No	Yes

The PSD netting analyses for NO₂, CO, and CO₂e are discussed in Section 4.1.2. The PSD netting analysis includes other contemporaneous emission increases and decreases at the facility in the past five years.

4.1.2 *PSD Emissions Netting Analysis (Step 2)*

If the emissions from a plan approval exceed the applicable significant emission rate for a PSD regulated pollutant, the facility can choose to net out the emissions increase from the plan approval with other reductions in emissions that have occurred during the contemporaneous emissions period. PSD regulations allow the use of a netting analysis to determine if a “significant net emission increase” will occur as a result of a plan approval. PES has performed the netting analysis consistent with PSD regulations in 40 CFR §52.21. A six-step procedure is used for determining the net emissions change and is summarized below.

⁶ EPA, 2010. Re: Hovensa Gas Turbine Nitrogen Oxides Prevention of Significant Deterioration (PSD) Permit Application – Emission Calculation Clarification; Letter from Stephen Riva, Permitting Chief to Kathleen Antoine, Environmental Director, Hovensa, LLC. March 30, 2010. While PES does not agree that this two-step analysis is compelled by the PSD regulations or the Clean Air Act, PES follows it here.

1. Emission Increases from the Proposed Plan Approval - Determine the emission increases from the proposed plan approval. If increases are significant, proceed; if not, the plan approval is not subject to PSD review.
2. Contemporaneous Period - Determine the beginning and ending dates of the contemporaneous period as it relates to the proposed plan approval.
3. Emissions Increases and Decreases during the Contemporaneous Period - Determine which emissions units at the facility experienced (or will experience, including any proposed decreases resulting from the proposed plan approval) a creditable increase or decrease in emissions during the contemporaneous period.
4. Creditable Emissions Changes - Determine which contemporaneous emissions changes are creditable.
5. Amount of the Emissions Increase and Decrease - Determine, on a pollutant-by-pollutant basis, the amount of each contemporaneous and creditable emissions increase and decrease.
6. PSD Review - Sum all contemporaneous and creditable increases and decreases with the emissions changes from the proposed plan approval to determine if a significant net emissions increase will occur.

In order to perform a netting analysis, the contemporaneous periods must be determined. The term "contemporaneous period" is defined in the PSD regulations as the period that includes the five (5) years prior to initiating construction on a proposed modification, and the period between the initiation of construction and the initiation of operation of the new or altered equipment. Because this plan approval involves no physical change to any units at the Refinery, the initiation of operation of the Heater Firing Rate Increase Plan Approval will occur immediately upon approval. Therefore, the contemporaneous period for this plan approval runs from 1st Quarter 2008 through the 1st Quarter 2013.

Contemporaneous and creditable emissions increases included in the PSD netting analysis are based on current facility permits. Where necessary, emissions increases from affected sources that were recently permitted and accounted for in the contemporaneous period have been deducted from the emissions increases sought as part of this Plan Approval. For example, in Plan Approval 08080 (September 2008), the No. 3 Boilerhouse was permitted to increase CO emissions by 82.40 tons based on the source's maximum potential to emit. As an ancillary affected unit in this Plan Approval, the future projected actual emissions for the No. 3 Boilerhouse are 23.52 tons of CO emissions above the 2010-2011 baseline,

which remains below the source's maximum potential to emit. Therefore, the contemporaneous emissions have been adjusted to avoid double-counting the CO emissions increases already permitted in Plan Approval 08080.

Table 4-2 below summarizes the contemporaneous and creditable emissions increases/decreases included in the plan approval PSD netting analysis. Detailed emissions estimates and netting analyses are provided in Attachment C.

Table 4-2 PSD Contemporaneous Netting Analysis (Step 2)

Emissions	NO ₂ Emissions (TPY)	CO Emissions (TPY)	CO ₂ e Emissions (TPY)
Heater Firing Rate Increase Plan Approval	123.2	129.6	181,045
Contemporaneous Increases/Decreases	10.9	182.9	0
Ancillary Emissions Increase Accounted for in Contemporaneous Emissions Increases ¹	-0.5	-24.2	---
Netting Credits Applied ²	-173.7	-199.3	-181,045
Total	-40.0	89.1	0
PSD Significance Level	40	100	75,000
PSD Review Required	No	No	No

¹ These emission increases are from ancillary units affected by the current plan approval, but are reflected in increases previously permitted during the contemporaneous period (Unit 859 Ultra-Low Sulfur Diesel Project in January 2008 and No. 3 Boilerhouse NO_x Reduction Project in September 2008). Thus, they must be removed to avoid double counting. See Attachment C for details.

² The quantity of netting credits applied for NO₂ is determined by the NA-NSR 5-calendar year netting analysis for ozone in Table 4-3 below. For CO and CO₂e, the net emissions were zeroed, where possible, using available netting credits.

As shown in Table 4-2, the Heater Firing Rate Increase Plan Approval does not exceed the PSD significance level for any NSR regulated pollutants; therefore, further PSD review is not required. In addition, the emissions of GHG are less than the applicable threshold; therefore, GHG is not considered a regulated pollutant in this plan approval.

4.2

NON-ATTAINMENT NEW SOURCE REVIEW ANALYSIS

Major sources located in nonattainment areas must evaluate whether a change constitutes a major modification under nonattainment NSR regulations (NA-NSR). The requirements are defined in 25 Pa Code

§127.201 through §127.217. For this plan approval, PES evaluated NA-NSR under the revised NSR requirements published in the *Pennsylvania Bulletin* on May 19, 2007. Currently, Philadelphia is designated as a moderate nonattainment area for ozone and nonattainment for PM_{2.5}.

Under the revised PA NSR regulation, facilities located in the five-county area (including Philadelphia County) are subject to NSR requirements for serious or severe ozone classification. The applicability threshold under the special permit requirements codified at §127.203(b) for serious or severe classification is 25 tpy for both VOC and NO_x emissions. When considering a modification, major sources must determine if either of the following conditions exceed the 25 tpy threshold for VOC or NO_x, which would subject the facility to special permit requirements:

- Increases or decreases in emissions from the plan approval are aggregated with other net emissions increases over the consecutive 5-calendar year period including the year in which the plan approval is constructed (calendar years 2009 – 2013 for this Plan Approval); and
- Increases or decreases in emissions from the plan approval are aggregated with other net emission increases or decreases over the previous 10-year period. If the result is over threshold levels, the facility is subject only to the emissions offset requirements codified at 25 Pa Code §127.205.

If the resulting net change exceeds the applicable thresholds, those emissions must be offset by a ratio of 1.3 to 1. If the offsets come from internal emission reductions, then Lowest Achievable Emission Rate (LAER) requirement does not apply (25 Pa Code §127.203(b)(3)).

Table 4-3 below presents a summary of plan approval emissions for VOC and NO_x aggregated with other net emissions increases over the consecutive 5-calendar year period including the year in which the plan approval implementation is planned (calendar years 2009 through 2013).

Table 4-3 NA-NSR Netting Analysis for VOC and NO_x Emissions (5-year)

Plan Approval	5-year NO _x (TPY)	5-year VOC (TPY)
Heater Firing Rate Increase Plan Approval	123.2	14.4
Contemporaneous Increases	10.4	2.6
Net Emissions Increase	133.6	17.0
Internal Offsets required (1.3:1 Ratio)	173.7	---
Netting Credits Applied ¹	-173.7	---
Net Emissions After Offsetting	0.0	17.0
NA-NSR Significance Level	25	25
NA-NSR Review Required	No	No

¹ The 5-calendar year net emission increase for NO_x is offset using internal netting credits at a ratio of 1.3:1 as required by 25 Pa Code §127.203(b)(3).

Table 4-4 below presents a summary of plan approval emissions for NO_x and VOC aggregated with other net emission increases or decreases over the previous 10-year period.

Table 4-4 NA-NSR Netting Analysis for VOC and NO_x Emissions (10-year)

Plan Approval	10-year NO _x (TPY)	10-year VOC (TPY)
Heater Firing Rate Increase Plan Approval	123.2	14.4
Contemporaneous Increases/Decreases	34.6	22.3
Ancillary Emissions Increase Accounted for in Contemporaneous Emissions Increases ¹	-0.5	-1.9
Netting Credits Applied ²	-173.7	-10.8
Net Emissions Increase	-16.3	24.0
NA-NSR Significance Level	25	25
NA-NSR Review Required	No	No

¹ These emission increases are from ancillary units affected by the current plan approval, but are reflected in increases previously permitted during the contemporaneous period (Unit 859 Ultra-Low Sulfur Diesel Project in January 2008 and No. 3 Boilerhouse NO_x Reduction Project in September 2008). Thus, they must be removed to avoid double counting. See Attachment C for details.

² The quantity of netting credits applied for NO_x is determined by the NA-NSR 5-calendar year netting analysis for ozone in Table 4-3 above. For VOC, the net emissions were netted to below the NA-NSR threshold using available netting credits.

As shown in Tables 4-3 and 4-4 above, the net emissions increases of VOC and NO_x from the proposed plan approval are below the NA-NSR

applicability thresholds of 25 tons per year. Therefore, the proposed plan approval is not subject to NA-NSR requirements for ozone.

For PM_{2.5}, NA-NSR will be triggered if changes in direct PM_{2.5} emissions exceed 10 tpy or emission changes associated with precursors such as NO_x or SO₂ exceed 40 tpy. As indicated in Table 4-5 below, NO_x emissions for the proposed plan approval exceed the NA-NSR regulatory threshold as a precursor to PM_{2.5}; therefore, as per 25 Pa Code §127.203a(a)(1)(i)(A), a netting analysis over the contemporaneous period must be performed.

Table 4-5 NA-NSR Analysis for SO₂, NO_x, and PM_{2.5} Emissions (Step 1)

Plan Approval	SO ₂ (TPY)	NO _x (TPY)	PM _{2.5} (TPY)
Heater Firing Rate Increase Plan Approval	3.9	123.2	10.9
NA-NSR Significance Level	40	40	10
NA-NSR Triggered (Before Netting Analysis)	No	Yes	Yes

As shown in Table 4-6 below, the PM_{2.5} and NO_x (as a PM_{2.5} precursor) netting analysis over the contemporaneous period shows that the emissions from the plan approval are not greater than the NA-NSR thresholds for PM_{2.5}. Therefore, the proposed plan approval is not subject to 25 Pa Code §127.203a for PM_{2.5}.

Table 4-6 NA-NSR Netting Analysis for PM_{2.5} and NO_x as PM_{2.5} Precursor (Step 2)

Plan Approval	NO _x (TPY)	PM _{2.5} (TPY)
Heater Firing Rate Increase Plan Approval	123.2	10.9
Contemporaneous Increases/Decreases	10.6	7.2
Ancillary Emissions Increase Accounted for in Contemporaneous Emissions Increases ¹	-0.5	-0.2
Netting Credits Applied ²	-173.7	-8.9
Net Emissions Increase	-40.3	9.0
NA-NSR Significance Level	40	10
NA-NSR Review Required	No	No

¹ These emission increases are from ancillary units affected by the current plan approval, but are reflected in increases previously permitted during the contemporaneous period (Unit 859 Ultra-Low Sulfur Diesel Project in January 2008 and No. 3 Boilerhouse NO_x Reduction Project in September 2008). Thus, they must be removed to avoid double counting. See Attachment C for details.

² The quantity of netting credits applied for NO_x is determined by the NA-NSR 5-calendar year netting analysis for ozone in Table 4-3 above. For PM_{2.5}, the net emissions were netted to below the NA-NSR threshold using available netting credits.

Local, State, and Federal regulations, in addition to NA-NSR and PSD have been reviewed for applicability to this plan approval. The following sections provide a summary of the review of applicable regulations.

5.1**PENNSYLVANIA REGULATIONS****5.1.1*****Best Available Technology (BAT)***

As part of this Plan Approval analysis, AMS has requested a Best Available Technology (BAT) analysis for the applicable target heaters, and PES provides this analysis below.

25 Pa Code §127.12(a)(5) provides that an application for a plan approval must show that emissions from a “new source” will be the minimum attainable through the use of Best Available Technology (BAT). 25 Pa Code §121.1 (Definitions) defines a new source as a source that was constructed and commenced operation on or after July 1, 1972, or a source that was modified so that the fixed capital cost of new components exceeds 50% of the fixed capital cost that would be required to construct a comparable entirely new source⁷.

The Unit 137 F-1 Heater, the Unit 231 B101 Heater and the Unit 210 H101 Heater are excluded from this analysis as they were installed prior to July 1, 1972 as shown in Table 5-1 below. While Unit 231 B101 Heater was upgraded in 2004 for the installation of low NO_x burners, the cost of those changes was not in excess of the 50% fixed capital cost described above for the project to be considered a “new source” per 25 Pa Code §121.1.

PES has completed a review of available and applicable emission controls beyond those already implemented on these heaters for all criteria pollutants. The target heaters covered by this plan approval and their corresponding construction dates at the Philadelphia Refinery are shown in Table 5-1 below.

⁷ The heaters involved in this plan approval are existing sources, not new sources as defined above. Further, the heaters are not being modified as defined above. Therefore, PES believes that BAT analysis is not required as a part of this Plan Approval application. Nonetheless, PES provides this BAT analysis in response to AMS' request for same.

Table 5-1 Target Heaters Construction Dates

Process Unit	Heater	Firing Rate Limit (MMBtu/Hr)	Construction Date
GP Unit 137 Crude	F-1 Crude Heater	460.0	1952
GP Unit 231 HDS	B101 Feed Heater	104.5	1957
PB Unit 865 HDS	11H1 Feed Heater	87.3	1973
PB Unit 865 HDS	11H2 Reboiler Heater	64.2	1973
PB Unit 210 Crude	H101 Crude Heater	192.0	1964
PB Unit 210 Crude	H-201A/B Crude Heater	254.0	1973
PB Unit 866 HDS	12H1 Feed Heater	61.2	1973
PB Unit 868 FCCU	8H101 Recycle Heater	60.0	1980

BAT is a pollutant-specific determination. Based on a review of established emission control technologies and emission limits in permits, the following text documents the results of the source and pollutant specific BAT determinations.

The Refinery reviewed publicly available databases to identify potential controls that have been installed on sources similar to the proposed heaters, including:

- EPA's New Source Review website;
- U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC) Database;
- Recent EPA consent decrees within the refining industry; and
- State and federal guidance documents.

Detailed discussion on the BAT analysis for all pollutants affected by this plan approval is presented below.

5.1.1.1 NO_x Controls

PES reviewed available and applicable NO_x controls that have been installed on process heaters at refineries or similar operations. Currently, combustion tuning is performed on the target heaters to reduce NO_x emissions. In addition, the Unit 210 H201A/B heater has ultra-low NO_x burners (ULNB) to reduce NO_x emissions.

The Refinery evaluated the potential emission reductions that could be achieved beyond the current baseline emissions using more stringent emission controls including:

- Low NO_x Burners (LNB);
- Selective catalytic reduction (SCR);
- Selective non-catalytic reduction (SNCR);
- A combination of ULNB plus SCR; and
- A combination of LNB plus SNCR.

All the controls identified above are considered technically feasible for process heaters. The Refinery estimated the cost effectiveness of additional NO_x controls beyond those currently installed on these heaters in the BAT NO_x cost effectiveness analysis presented in Attachment F. As PES is a recently established company, the cost of borrowing capital (the minimum return that investors expect for providing capital to the company) is considered at a higher risk than many established companies. The cost effectiveness analysis reflects the current cost of capital for PES, which is 21.83%.

The estimates of potential emission reductions that could be achieved through the application of additional controls, and corresponding control effectiveness costs (\$/ton), are calculated in two ways. One analysis is based on the total emissions from the sources (in the same manner as would be done if these sources were, in fact, brand new sources). The second analysis is based on the incremental emission increases sought in this plan approval, resulting in a cost effectiveness value reflecting the costs on \$/ton of emission increase basis. This second analysis more accurately reflects that the sources being reviewed are not brand new sources and that the controls are being assessed only due to the increase in emissions sought in this plan approval application.

In the cost analyses contained here, the costs for NO_x CEMS have not been included in the control effectiveness costs. However, it is expected that installation of a CEMS would likely be requested by AMS as part the installation of any of the control options considered. Adding a CEMS would result in an estimated additional \$40,000 in annualized costs, which corresponds to an actual additional cost of \$1,400 to \$3,900 per ton depending on the NO_x emission rate. Therefore, the control effectiveness costs presented in Attachment F are considered conservative since the actual costs to the Refinery are expected to be greater.

For the Unit 210 H201A/B heater, PES determined that SCR cannot physically fit the plot plan and there is inadequate pressure from the burners to overcome the SCR pressure drop. Flue gas recirculation would require the installation of mechanical draft burners, a major re-design of the unit. Accordingly, the current ULNB is considered BAT for the Unit 210 H201A/B heater. For the remaining heaters (Unit 865 11H1, Unit 865 11H2, Unit 866 12H1, and Unit 868 8H101), additional NO_x controls beyond combustion tuning are not cost effective, as set forth in Attachment F. As a result, existing NO_x controls in the form of combustion tuning (and ULNB for 210 H201A/B) are BAT for these heaters.

5.1.1.2 *CO Controls*

The available emission controls for reducing CO emissions from heaters are:

- Good combustion practices; and
- Oxidation catalysts.

Based on our review of EPA's RBLIC database, Bay Area Air Quality Management District (BAAQMD) BACT database (see Attachment G), and other permits issued for refineries, there are no documented cases of oxidation catalysts being implemented on similarly sized heaters. This shows that an installation of oxidation catalyst for heaters of this size has not been demonstrated. This is largely due to operational limitations of the oxidation catalysts. The installation of oxidation catalyst in flue gas containing more than trace levels of SO₂ will result in poisoning and deactivation of the catalyst by sulfur-containing compounds, as well as increasing the conversion of SO₂ to SO₃. The increased conversion of SO₂ to SO₃ will increase condensable particulate matter emissions, which will foul the catalyst prohibiting oxidation as well as increasing flue gas system corrosion rates. Another operating limitation is that oxidation catalysts typically operate at 650 degrees Fahrenheit (°F) to 1,000°F to be effective at minimizing CO emissions. None of the heaters in this BAT analysis achieve stack temperatures within the typical operating range of an oxidation catalyst.

For the above reasons, the use of oxidation catalyst for CO is not considered technically feasible for the refinery fuel gas fired process heaters.

While the Refinery believes that the use of oxidation catalyst is not a demonstrated technology for refinery heaters, the Refinery has estimated

the cost effectiveness and the results are presented in Attachment H. An EPA guidance document was used as the basis for this analysis and limitations regarding stack temperatures relative to required catalyst operating temperatures as well as any impacts of catalyst fouling were ignored. Further note - as PES is a recently established company, the cost of borrowing capital (the minimum return that investors expect for providing capital to the company) is considered at a higher risk than many established companies. The cost effectiveness analysis reflects the current cost of capital for PES, which is 21.83%.

The estimates of potential emission reductions that could be achieved through the application of an oxidation catalyst, and corresponding control effectiveness costs (\$/ton), are calculated based on the total CO emissions from the sources. As shown in Attachment H, even when using the most conservative capital and annual operating and maintenance costs and ignoring potential issues regarding flue gas temperatures, the installation of oxidation catalyst for CO control would not be considered cost effective.

Good combustion practice is the predominantly used control option for reducing CO emissions from process heaters. PES currently implements a comprehensive program of quarterly combustion tuning, as required by the facility's RACT permit. The use of combustion tuning and implementation of periodic maintenance on the heaters ensure that the CO emissions are limited. Accordingly, good combustion practices are BAT for limiting CO emissions from the heaters.

5.1.1.3 *PM/PM₁₀/PM_{2.5} Controls*

The available emission control options for reducing PM emissions from the heaters include:

- Good combustion practices;
- Electrostatic precipitators;
- Baghouse or fabric filters; and
- Use of gaseous fuels.

Refinery fuel gas will be used as the only fuel for these heaters. Based on our review of the RBLC database, BAAQMD, and permits issued at refineries, ESPs or baghouses are not installed on similarly sized heaters fired on refinery fuel gas. Though these control options are potentially technically feasible for combustion sources such as process heaters, they

are not commercially demonstrated on similarly sized process heaters. Therefore, these control options are not further considered in this evaluation. The refinery fuel gas fired in the heaters is comprised of a significant amount of natural gas and therefore, is similar in heating value and characteristics to natural gas. Therefore, BAT for limiting PM emissions is good combustion practices and firing of refinery fuel gas.

5.1.1.4 *SO₂ Controls*

The available emission control options for minimizing SO₂ emissions from the heaters include:

- Wet flue gas desulfurization (FGD) scrubber;
- Dry FGD scrubber; and
- Use of gaseous fuels.

Based on a review of EPA's RBLC and BAAQMD databases, and permits issued for refineries, wet FGD and dry FGD systems have not been installed on natural gas or refinery fuel gas fired heaters at any refinery in the country. Though these control options are potentially technically feasible for combustion sources such as process heaters, they are not commercially demonstrated on similarly sized process heaters. Therefore, these control options are not considered further in this evaluation.

As described earlier, refinery fuel gas consists of a combination of refinery process by-product gas and natural gas. The refinery by-product gas is desulfurized prior to supplementing with natural gas through a mix drum in order to ensure New Source Performance Standards (NSPS) Subpart J limits are met prior to combustion. Refinery fuel gas is used at every refinery in the country as part of balancing available energy from process operations and by-products; the use of refinery fuel gas is BAT for the target heaters for SO₂.

5.1.1.5 *VOC Controls*

The available emission control options for minimizing VOC emissions from the heaters include:

- Oxidation catalysts; and
- Good combustion practices; and
- Use of gaseous fuels.

Based on our review of the RBLC and BAAQMD databases, oxidation catalysts have not been demonstrated on process heaters at refineries. The predominant control option to reduce VOC emissions from process heaters is the use of good combustion practice. The use of oxidation catalyst is not commercially demonstrated on refinery process heaters. Therefore, oxidation catalysts are not considered further in this analysis.

PES currently implements a comprehensive program of quarterly combustion tuning, as required by the facility's RACT permit. The use of combustion tuning and implementation of periodic maintenance on the heaters ensures that the VOC emissions are limited.

The heaters only fire refinery fuel gas which is lower in VOC content than liquid fuels and some other gaseous fuels. The Refinery removes many VOCs from the by-product gases before they are sent to the refinery fuel gas system and thus refinery fuel gas consists of mostly non-VOC compounds such as methane, ethane, and hydrogen.

The use of good combustion practices and firing of refinery fuel gas is BAT for VOC.

5.1.2

Reasonably Achievable Control Technology (RACT) Analysis

The current Title V permit limits the firing rate on the heaters to comply with the RACT regulatory requirements codified in 25 Pa Code §129.91 through §129.95. With this Plan Approval application, the Refinery proposes to increase the firing rate limits in the Title V permit. PES conducted this RACT analysis to reflect the revised firing rate limitations.

Three of the target heaters Unit 865 11H2, Unit 866 12H1, and Unit 868 8H101, previously had firing rate limits less than 50 MMBtu/hr and were therefore subject to presumptive NO_x controls established under PADEP's RACT regulatory requirements. Presumptive RACT required the use of combustion tuning rather than physical controls. Because these three heaters are seeking firing rate limits over 50 MMBtu/hr, PES has provided a RACT analysis in Attachment I for these heaters as a part of this Plan Approval application along with the other target heaters. In this application, the cost effectiveness calculations for the RACT analyses were based on the estimates developed in an engineering study conducted in 1999 for the then-established RACT limits. These costs – capital and Operation and Maintenance (O&M) – were scaled up to 2012 dollar amounts using *Chemical Engineering* cost indices. PES has also updated the RACT analysis conducted in 1999 to reflect the current cost of borrowing capital. As PES is a recently established company under new ownership, the cost of borrowing capital (the minimum return that

investors expect for providing capital to the company) is considered at a higher risk than many established companies. The cost effectiveness analysis reflects the current cost of capital for PES, which is 21.83%.

The Unit 210 H101 Heater already has LNB installed⁸; however, the installation of current generation UNLB is not cost effective. Unit 210 H201A/B has NO_x control today at a permit limit of 0.03 lb/MMBtu, and no further control is deemed to be cost effective as indicated by the RACT analysis.

As illustrated in Attachment I, for the remaining heaters, additional retrofit NO_x control options beyond combustion tuning are not cost effective. Therefore, combustion tuning is RACT for these heaters. Note that the Refinery has completed combustion tuning for several years on the heaters and these data indicate that emission rates after tuning are generally lower than the proposed RACT emission rates. The tuning data support that the emission reductions and thus cost-effectiveness stated in this analysis are conservatively estimated.

5.2

AIR MANAGEMENT SERVICES REGULATIONS

AMS Regulations incorporate Pennsylvania air contaminant emissions limits and control efficiencies (Regulation I, Section X) and include by reference, the Federal regulations (AMS Regulation 1, Section XI). AMS also regulates SO₂ emissions (Regulation III, Section II), fuel sulfur content (Regulation III, Section III), pump and compressor emissions (Regulation V, Section IV), and process equipment leaks (Regulation V, Section XIII).

With regard to Regulation VI, there will be no new air toxic contaminants associated with this plan approval.

There are no AMS regulations that are significantly different from, or more stringent than, the regulations cited herein. The proposed plan approval will not result in any additional AMS applicable requirements.

5.3

OTHER FEDERAL REGULATIONS

5.3.1

New Source Performance Standards (NSPS)

The Refinery evaluated whether increasing the firing rates for the target heaters triggers the applicability of New Source Performance Standards

⁸ Burners were considered UNLB when installed, but referred to here as LNB to avoid confusion.

(NSPS) for any Refinery sources. No physical changes or capital expenditures are required to accommodate the increase in firing rates. As such, no sources are considered to be modified sources under EPA's New Source Performance Standards (NSPS) codified under 40 CFR Part 60. Specifically, 40 CFR 60.14(e)(2) excludes from the definition of modification...

"an increase in production rate of an existing facility, if that increase can be accomplished without a capital expenditure on that facility."

The increase in heater firing rates sought in this plan approval represents a production rate increase for the target heaters. All of the heaters serve the same overall purpose - to produce heated hydrocarbon streams for processing. Additionally, as discussed in published EPA guidance, both changes in production rate and operating changes are included in the assessment of capital expenditure associated with the plan approval⁹.

The change in firing rates for the target heaters in this plan approval can be achieved without any capital expenditure. Therefore, the target heaters are not considered modified sources and therefore are not subject to NSPS.

5.3.2

Maximum Achievable Control Technology (MACT)

The target heaters will be subject to the National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (Boiler MACT) codified in 40 CFR §63.7490 once the final rule is promulgated. The existing target heaters must be in compliance with Boiler MACT by the date required in 40 CFR §63.7495(b). The Refinery will demonstrate initial compliance within 180 days of the compliance date as required by 40 CFR §63.7510(e).

⁹ EPA, 1989. Re: Applicability of NSPS. Letter from Don R. Clay, Acting Assistant EPA Administrator of EPA to Mr. John W. Boston, WEPCO, February 15, 1989.

PES proposes the following permit conditions and compliance methods for the proposed plan approval. The target heaters will be subject to revised firing rate limits as shown in Table 6-1.

Table 6-1 Revised Firing Rate Limits for Target Heaters

Process Unit	Heater	Proposed Hourly Firing Limit (MMBtu/hr)	Proposed Annual Firing Limit (MMBtu/year)	RACT NO _x Firing Rate Limit (lb/MMBtu)
GP Unit 137 Crude	F-1 Crude Heater	460.0	3,767,000	0.123
GP Unit 231 HDS	B101 Feed Heater	104.5	856,000	0.122
PB Unit 865 HDS	11H1 Feed Heater	87.3	699,000	0.113
PB Unit 865 HDS	11H2 Reboiler Heater	64.2	500,000	0.113
PB Unit 210 Crude	H101 Crude Heater	192.0	1,643,000	0.089
PB Unit 210 Crude	H-201A/B Crude Heater	254.0	2,172,000	0.03
PB Unit 866 HDS	12H1 Feed Heater	61.2	456,000	0.113
PB Unit 868 FCCU	8H101 Recycle Heater	60.0	480,000	0.113

Compliance with the hourly firing rate limits will be demonstrated on a daily average basis. The Refinery will monitor the inputs to the heaters including fuel throughput (scf/hour) and heat content (Btu/scf) on an hourly basis to calculate a daily average for compliance with the firing rate limits.

Compliance with the annual firing rate limits will be demonstrated on a rolling 365-day basis. The Refinery will monitor the daily average firing rate for compliance with the annual firing rate limits.

Combustion tuning will be RACT for the following heaters: Unit 137 F-1; Unit 231 B101; Unit 865 11H1; Unit 865 11H2; Unit 866 12H1; and Unit 868 8H101 as well as compliance with the RACT NO_x firing rate limit for each heater listed in Table 6-1 above.

Low NO_x Burners (LNB) will be RACT for the Unit 210 H101 Heater and Ultra-Low NO_x Burners (ULNB) will be RACT for the Unit 210 H-201A/B Heater as well as compliance with the RACT NO_x firing rate limit for each heater listed in Table 6-1 above.

Attachment A
AMS Plan Approval Application
Forms



CITY OF PHILADELPHIA

DEPARTMENT OF PUBLIC HEALTH
PUBLIC HEALTH SERVICES
AIR MANAGEMENT SERVICES

Air Management Services
321 University Avenue
Philadelphia PA 19104-4543
Phone: (215) 685-7572
FAX: (215) 685-7593

APPLICATION FOR PLAN APPROVAL TO CONSTRUCT, MODIFY OR REACTIVATE AN AIR CONTAMINATION SOURCE AND/OR AIR CLEANING DEVICE *(Prepare all information completely in print or type in triplicate)*

SECTION A - APPLICATION INFORMATION

Location of source (Street Address) 3144 Passyunk Avenue	Facility Name PES Philadelphia Refinery	
Owner Philadelphia Energy Solutions Refining & Marketing, LLC	Tax ID No. 61-1689574	
Mailing Address 3144 Passyunk Avenue, Philadelphia, PA 19145	Telephone No. (215) 339-2074	Fax No. (215) 339-2657
Contact Person Charles D. Barksdale	Title Manager, Environmental Department	
Mailing Address 3144 Passyunk Avenue, Philadelphia, PA 19145	Telephone No. (215) 339-2074	Fax No. (215) 339-2657

SECTION B - DESCRIPTION OF ACTIVITY

Application type <input type="checkbox"/> New source <input type="checkbox"/> Modification <input type="checkbox"/> Replacement <input type="checkbox"/> Reactivation <input type="checkbox"/> Air cleaning device <input checked="" type="checkbox"/> Other	SIC Code 2911	Completion Date On Approval
<input type="checkbox"/> NSPS <input type="checkbox"/> NESHAP <input type="checkbox"/> Case by Case MACT <input type="checkbox"/> NSR <input type="checkbox"/> PSD	Does Facility submit Compliance Review Form biannually? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If No attach Air Pollution Control Act Compliance Review Form with this application.	

Source Description: The Sunoco Philadelphia Refinery proposes to marginally increase the firing limitations of eight process heaters and to raise refinery crude feed and product rates by proportionate amounts. No physical modifications are required to either process units or monitoring systems. Emissions increases will be netted to insignificant levels by the application of coincident ERC's from shutdown units at the Sunoco Marcus Hook, Pa Refinery

SECTION C - PERMIT COORDINATION (ONLY REQUIRED FOR LAND DEVELOPMENT)

Question	YES	NO
1. Will the project involve construction activity that disturbs five or more acres of land?		X
2. Will the project involve discharge of industrial wastewater or stormwater to a dry swale, surface water, ground water or an existing sanitary sewer system?		X
3. Will the project involve the construction and operation of industrial waste treatment facility?		X
4. Is onsite sewage disposal proposed for your project?		X
5. Will the project involve construction of sewage treatment facilities, sanitary sewer, or sewage pumping station?		X
6. Is a stormwater collection and discharge system proposed for this project?		X
7. Will any work associated with this project take place in or near a stream, waterway, or wetland?		X
8. Does the project involve dredging or construction of any dam, pier, bridge or outfall pipe?		X
9. Will any solid waste or liquid wastes be generated as a result of the project?		X
10. Is a State Park located within two miles from your project?		X

SECTION D - CERTIFICATION

I certify that I have the authority to submit this Permit Application on behalf of the applicant named herein and that the information provided in this application is true and correct to the best of my knowledge and information.

Signature Nithia Thaver Date 11/1/12 Address 3144 Passyunk Avenue, Philadelphia, PA 19145

Name & Title Nithia Thaver, General Manager Phone (215) 339-7414 Fax (215) 339-2657

SECTION E - OFFICIAL USE ONLY

Application No.	Plant ID	Health District	Census Tract	Fee	Date Received
Approved by	Date	Conformance by			Date

SECTION F 1 - GENERAL SOURCE INFORMATION

1. SOURCE						2. NORMAL PROCESS OPERATING SCHEDULE							
	A. Type Source (Describe)	B. Manufacturer of Source	C. Model No.	D. Rated Capacity (Specify units)	E. Type of Materials Processed	A. Amount Processed/yr. (Specify units)	B. Average hr/day	C. Total hr/yr	D. % Throughput/Quarter				
									1 st	2 nd	3 rd	4 th	
1	Eight targeted heaters												
	See Attached Report for												
	Proposed Heater Firing												
	Changes Without Physical												
	Changes												
3. ESTIMATED FUEL USAGE (Specify Units)						4. ANNUAL FUEL USAGE							
A. Used in Unit	B. Type Fuel	C. Average Hourly Rate	D. Maximum Hourly Rate	E. Percent Sulfur	F. Percent Ash	G. Heating Value	A. Annual Amounts	B. Average hr/day	C. Total hr/yr	D. % Throughput/Quarter			
										1 st	2 nd	3 rd	4 th
	See Attached Report for												
	Proposed Fired Htr. Duty												
	Changes												
5. IMPORTANT: Attach on a separate sheet a flow diagram of process giving all (gaseous, liquid, and solid) flow rates. Also list raw materials charged to process equipment and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, hoods or other pickup points, etc.).													

SECTION F 1 - GENERAL SOURCE INFORMATION, CONTINUED

6. Describe process equipments in detail.

See Attached Report Sections

7. Describe fully the methods used to monitor and record all operating conditions that may affect the emission of air contaminants. Provide detailed information to show that these methods provided are adequate.

No New Monitoring Equipment is Proposed or Required

8. Describe modifications to process equipments in detail.

See Attached Report Sections - No Physical Changes are Proposed or Required

9. Attach any and all additional information necessary to adequately describe the process equipment and to perform a thorough evaluation of the extent and nature of its emissions.

See Attached Report that includes a BAT/RACT analysis

SECTION F 2 - COMBUSTION UNITS INFORMATION

1. COMBUSTION UNITS F-1; H101; H201A/B; 11H1; 11H2; 12H1; 8H101; B101 – See Discussion Sections

A. Manufacturer NA	B. Model No. NA	C. Unit No. NA
D. Rated heat input (Btu/hr) NA	E. Peak heat input (Btu/hr) NA	F. Use NA

G. Method firing

Pulverized Spreader Stoker Cyclone Tangential Normal Fluidized bed Other _____

2. FUEL REQUIREMENTS

TYPE	QUANTITY HOURLY	QUANTITY ANNUALLY	SULFUR	ASH	BTU CONTENT
OIL NUMBER NA	NA	NA	NA	NA	NA
OTHER NA	NA	NA	NA	NA	NA

3. COMBUSTION AIDS, CONTROLS, AND MONITORS -- (No New Equipment)

<input type="checkbox"/> A. Overfire jets	Type	Number	Height above grate
<input type="checkbox"/> B. Draft controls	Type	Type	
<input type="checkbox"/> C. Oil preheat			
<input type="checkbox"/> D. Soot cleaning	Temperature (° F)	Frequency	
<input type="checkbox"/> E. Stack sprays	Method		
<input type="checkbox"/> F. Opacity monitoring device		Method	Cost
<input type="checkbox"/> G. Sulfur oxides monitoring device	Type	Method	Cost
<input checked="" type="checkbox"/> H. Nitrogen oxides monitoring device	Type	Method	Cost
<input checked="" type="checkbox"/> I. Fuel metering and/or recording devices	Type	Method	Cost
<input type="checkbox"/> J. Atomization interlocking device	Type	Method	Cost
<input type="checkbox"/> K. Collected flyash reentrainment preventative device	Type		
<input type="checkbox"/> L. Modulating controls	<input type="checkbox"/> Step <input checked="" type="checkbox"/> Automatic		

4. Flyash reinjection. (Describe operation)

N/A

5. Describe method of supplying make up air to the furnace room.

N/A

- USE THIS PAGE FOR COMBUSTION SOURCE, OTHERWISE REMOVE THIS PAGE FROM THIS APPLICATION.
- IF THERE ARE MORE THAN ONE UNIT, COPY THIS PAGE AND FILL IN THE INFORMATION AS INDICATED

SECTION F 2 - COMBUSTION UNITS INFORMATION, CONTINUED

6. OPERATING SCHEDULE

NA _____ hours/day NA _____ days/week NA _____ weeks/year

7. SEASONAL PERIODS (MONTHS) N/A

Operating using primary fuel _____ Operating using secondary fuel _____

_____ to _____

_____ to _____

Non-operating

_____ to _____

8. If heat input is in excess of 250×10^6 Btu/hr., describe fully the methods used to record the following: rate of fuel burned; heating value, sulfur and ash content of fuels; smoke, sulfur oxides and nitrogen oxides emissions; and if electric generating plant, the average electrical output and the minimum and maximum hourly generation rate.

PES will continue to monitor, record, and report with applicable requirements found in the Philadelphia Refinery's existing Title V permit and the Consent Decree

9. Describe modifications to boiler in detail.

No Physical Changes are Proposed or Required

**10. Type and method of disposal of all waste materials generated by this boiler.
(Is a Solid Waste Disposal Permit needed? Yes No)**

**11. Briefly describe the method of handling the waste water from this boiler and its associated air pollution control equipment.
(Is a Water quality Management Permit needed? Yes No)**

12. Attach any and all additional information necessary to perform a thorough evaluation of this boiler.

See Attached Report Sections

- USE THIS PAGE FOR COMBUSTION SOURCE, OTHERWISE REMOVE THIS PAGE FROM THIS APPLICATION.
- IF THERE ARE MORE THAN ONE UNIT, COPY THIS PAGE AND FILL IN THE INFORMATION AS INDICATED

SECTION G - FLUE AND AIR CONTAMINANT EMISSION INFORMATION

I. STACK AND EXHAUSTER

This project does not involve any changes to existing stacks or emission points.

A. Outlet volume of exhaust gases CFM @ _____ °F _____ % Moisture	B. Exhauster (attach fan curves) _____ in w.g. _____ HP @ _____ RPM
C. Stack height above grade (ft) _____ Grade elevation (ft) _____ Distance from discharge to nearest property line (ft) _____	D Stack diameter (ft) or Outlet duct area (sq. ft.) E Weather Cap <input type="checkbox"/> YES <input type="checkbox"/> NO

F. Indicate on an attached sheet the location of sampling ports with respect to exhaust fan, breeching, etc. Give all necessary dimensions.

2 POTENTIAL PROCESS EMISSIONS (OUTLET FROM PROCESS, BEFORE ANY CONTROL EQUIPMENT)

See Attached Report Sections

A. Particulate loading (lbs/hr or gr/DSCF)	B. Specific gravity of particulate (not bulk density)	C. Attached particle size distribution information	
D. Specify gaseous contaminants and concentration			
Contaminant	Concentration	VOC Contaminants	Concentration
(1) SO _x	ppm (Vol.) _____ lbs/hr	(4)	ppm (Vol.) _____ lbs/hr
(2) NO _x	ppm (Vol.) _____ lbs/hr	(5)	ppm (Vol.) _____ lbs/hr
(3) CO	ppm (Vol.) _____ lbs/hr	(6)	ppm (Vol.) _____ lbs/hr

E. Does process vent through the control device? YES NO

- If YES continue and fill out the appropriate SECTION H - CONTROL EQUIPMENT
- If NO skip to SECTION I - MISCELLANEOUS INFORMATION

F. Can the control equipment be bypassed: (If Yes, explain) YES NO

3. ATMOSPHERIC EMISSIONS

A. Particulate matter emissions (tons per year)

See Attached Report Sections

B. Gaseous contaminant emissions			
Contaminants	Concentration	VOC Contaminants	Concentration
(1)	(tpy)	(4)	(tpy)
(2)	(tpy)	(5)	(tpy)
(3)	(tpy)	(6)	(tpy)

See Attached Report Sections

SECTION H - CONTROL EQUIPMENT, CONTINUED**12. COSTS – See the attached report – No New Equipment**

A. List costs associated with control equipment. (List individual controls separately)

Control Equipment Cost:

Direct Cost:

Indirect Cost:

B. Estimated annual operating costs of control equipment only.

13. Describe modifications to control equipment in detail.

N/A

14. Describe in detail the method of dust removal from the air cleaning and methods of controlling fugitive emissions from dust removal, handling and disposal.

N/A

15. Does air cleaning device employ hopper heaters, hopper vibrators or hopper level detectors? If so, describe.

N/A

16. Attach manufacturer's performance guarantees and/or warranties for each of the major components of the control system (or complete system).

17. Attach the maintenance schedule for the control equipment and any part of the process equipment that if in disrepair would increase the air contaminant emissions. Periodic maintenance reports are to be submitted to the Department.

Maintenance will continue to be provided as per the manufacturer's recommendations and the Title V Permit.

18. Attach any and all additional information necessary to thoroughly evaluate the control equipment.

No New Control Equipment

SECTION I - MISCELLANEOUS INFORMATION

1. Specify monitoring and recording devices will be used for monitoring and recording of the emission of air contaminants. Provide detailed information to show that the facilities provided are adequate. Include cost and maintenance information.

- | | | |
|--|---|--|
| <input type="checkbox"/> Opacity monitoring system | <input type="checkbox"/> SOx monitoring system | <input checked="" type="checkbox"/> NOx monitoring system |
| <input type="checkbox"/> CO monitoring system | <input type="checkbox"/> CO2 monitoring system | <input checked="" type="checkbox"/> Oxygen monitoring system |
| <input type="checkbox"/> HCL monitoring system | <input type="checkbox"/> TRS monitoring system | <input type="checkbox"/> H2S monitoring system |
| <input type="checkbox"/> Temperature monitoring system | <input type="checkbox"/> Stack flow monitoring system | <input type="checkbox"/> Other _____ |

If checked, provide manufacturer's name, model no. and pertinent technical specifications.

NO CHANGES PROPOSED FROM EXISTING MONITORING, AS OUTLINED IN EXISTING TITLE V PERMIT.

- PROVIDE CONTROL EQUIPMENT INFORMATION ON THIS PAGE IF IT PERTAINS TO THIS APPLICATION, OTHERWISE REMOVE THIS PAGE FROM THE APPLICATION.
- IF THERE ARE MORE OF THE SAME TYPE OF CONTROL EQUIPMENT, COPY THAT PAGE AND FILL IN THE INFORMATION AS INDICATED.
- CONTROL EQUIPMENT CAN BE FOUND FROM A MANUFACTURER CATALOGUE OR VENDORS.

2. Attach Air Pollution Episode Strategy (if applicable)

NA

3. If the source is subject to 25 Pa. Code Subchapter E, New Source Review requirements,

a. Demonstrate the availability of emission offset (if applicable)

b. Provide an analysis of alternate sites, sizes, production processes and environmental control techniques demonstrating that the benefits of the proposed source outweigh the environmental and social costs.

NSR is not applicable; see the attached Report Sections.

4. Attach calculations and any additional information necessary to thoroughly evaluate compliance with all the applicable requirements of Article III of the rules and regulations of Philadelphia Air Management, Pennsylvania Department of Environmental Protection and those requirements promulgated by the Administrator of the United States Environmental Protection Agency pursuant to the provisions of the Clean Air Act.

See Attached Report Sections

- PROVIDE CONTROL EQUIPMENT INFORMATION ON THIS PAGE IF IT PERTAINS TO THIS APPLICATION, OTHERWISE REMOVE THIS PAGE FROM THE APPLICATION.
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- CONTROL EQUIPMENT CAN BE FOUND FROM A MANUFACTURER CATALOGUE OR VENDORS.

Attachment B
Compliance Review History

Compliance History Review

The Pa. Code 25 Section 127.12 requires either a completed compliance review form, or reference to the most recently submitted forms for facilities submitting a compliance review form on a periodic basis. PES plans to file a compliance review semi-annually per 127.12a(j). The latest form covering the Philadelphia Refinery was sent by Sunoco, the previous owner of the PES Philadelphia facility, to the offices of Philadelphia Air Management Services in May of 2012. Since PES is a new company, no compliance history exists.

Attachment C
Emissions Calculations

PES Refinery

Heater Firing Rate Increase Plan Approval

PSD/NSR Analysis

Heater Firing Rate Increase Plan Approval Emissions										
Source	Pollutant (TPY)									
	NO _x	SO ₂	CO	VOC	PM	PM ₁₀ /PM _{2.5}	H ₂ SO ₄	Lead	HAP [†] CO ₂ e	
Target Heater Emissions	78.7	3.3	60.1	3.9	5.4	5.4	0	3.6E-04	0	86,115
Ancillary Upstream/Downstream Units	4.6	0.9	13.4	6.3	0.04	0.04	0	0	0	3,029
Ancillary Upstream/Downstream Unmodified Heaters/Boiler	39.9	1.6	56.1	4.2	5.4	5.4	0	3.6E-04	0	91,901
Total Plan Approval Emissions	123.2	3.9	129.6	14.4	10.9	10.9	0.0	7.2E-04	0.0	181,045

Step 1. PSD Emissions Analysis									
Emissions	Pollutant (TPY)								
	NO _x	SO ₂	CO	PM	PM ₁₀	H ₂ SO ₄	Lead	CO ₂ e	
Heater Firing Rate Increase Plan Approval	123.2	3.9	129.6	10.9	10.9	0.0	7.2E-04	181,045	
PSD Significance Level	40	40	100	25	25	7	0.6	15,000	
PSD Triggered (Before Netting Analysis)	Yes	No	Yes	No	No	No	No	Yes	

Step 2. PSD Netting Analysis			
Emissions	NO _x Emissions (TPY)	CO Emissions (TPY)	CO ₂ e Emissions (TPY)
Heater Firing Rate Increase Plan Approval	123.2	129.6	181,045
Contemporaneous Increases/Decreases	10.9	182.9	0
Ancillary Emissions Increase Accounted for in Contemporaneous Emissions Increases	-0.5	-24.2	---
Netting Credits Applied	-173.7	-199.3	181,045
Total	-40.0	89.1	0
PSD Significance Level	40	100	75,000
PSD Review Required	No	No	No

NA-NSR Ozone Netting Analysis		
Plan Approval	5-year NO _x (TPY)	5-year VOC (TPY)
Heater Firing Rate Increase Plan Approval	123.2	14.4
Contemporaneous Increases	10.4	2.6
Net Emissions Increase	123.6	17.0
Internal Offsets required (1:1 Ratio)	173.7	---
Netting Credits Applied	-173.7	---
Net Emissions After Offsetting	0.0	17.0
NA-NSR Significance Level	25	25
NA-NSR Review Required	No	No

NA-NSR Ozone Netting Analysis		
Plan Approval	10-year NO _x (TPY)	10-year VOC (TPY)
Heater Firing Rate Increase Plan Approval	123.2	14.4
Contemporaneous Increases/Decreases	34.6	22.3
Ancillary Emissions Increase Accounted for in Contemporaneous Emissions Increases	-0.5	-1.9
Netting Credits Applied	-173.7	-10.8
Net Emissions Increase	-16.3	24.0
NA-NSR Significance Level	25	25
NA-NSR Review Required	No	No

NA-NSR PM _{2.5} Emissions Analysis			
Plan Approval	SO ₂ (TPY)	NO _x (TPY)	PM _{2.5} (TPY)
Heater Firing Rate Increase Plan Approval	3.9	123.2	10.9
NA-NSR Significance Level	40	40	10
NA-NSR Triggered (Before Netting Analysis)	No	Yes	Yes

NA-NSR PM _{2.5} Netting Analysis		
Plan Approval	NO _x (TPY)	PM _{2.5} (TPY)
Heater Firing Rate Increase Plan Approval	123.2	10.9
Contemporaneous Increases/Decreases	10.6	7.2
Ancillary Emissions Increase Accounted for in Contemporaneous Emissions Increases	-0.5	-0.2
Netting Credits Applied	-173.7	-8.9
Net Emissions Increase	-40.3	9.0
NA-NSR Significance Level	40	10
NA-NSR Review Required	No	No

PES Refinery

Heater Firing Rate Increase Plan Approval

Summary of Contemporaneous Period Emissions

Facility	Permit No.	Activity	Effective Date of Change	NANSR Net Emission Change, Ton/Yr				
				VOC	NO _x	PM _{2.5}	PM _{2.5} /NO _x	PM _{2.5} /SO ₂
Point Breeze	02184	Tier II Gasoline	2003	0.00	0.00	0.00	0.00	68.59
Point Breeze	02184	Htr. 13H1 Fuel Switch Under Tier II	12/29/2003	0.00	0.00	0.00	0.00	-29.70
Marcus Hook	Delaware permit	Sulfur Recovery Unit (done in Delaware)	3/26/2003	0.40	0.00	0.56	0.00	0.00
Point Breeze	03124	433 Alkylation Reappl.	2004	0.00	0.00	0.00	0.00	0.00
Point Breeze	03163	869 Alky. Reactivation	2004	0.00	0.00	0.00	0.00	0.40
Marcus Hook	Pa23-0001 U & W	LSG Revised took out Hydrogen plant etc	2004	6.40	23.00	6.20	23.00	29.77
Point Breeze	04208	Emergency Generator	2004	0.00	0.00	0.00	0.00	0.07
Gir. Pt./Pt. Br.	04237	865 ULSD	2004	0.00	0.00	0.00	0.00	7.36
Gir. Pt./Pt. Br.	04322	1232 Flue Gas Treating & Expansion	2006	0.00	0.00	1.23	0.00	12.55
Point Breeze	05219	866 Unit Modification for ULSD mode	2006	0.00	0.00	0.00	0.00	1.07
Girard Point	NA	Demin. valves and flanges at Units 433/869	2006	0.00	0.00	0.00	0.00	0.00
Girard Point	06050	433 HFAU Process Improvement Project	2006	0.00	0.00	1.88	0.00	36.35
Marcus Hook	De minimis	Alky cooling project- chill the feed with rental	3/3/2006	0.07	0.99	0.16	0.99	0.13
Girard Point	07026	231 Imported Jet Project	2007	0.00	0.00	0.51	0.00	2.51
Gir. Pt./Pt. Br.	06144	859 Reactivation Project	2008	0.00	0.00	7.50	0.00	43.21
Girard Point	08080	No. 3 Boiler House NO _x Reduction	2008	12.52	0.00	ND*	0.00	0.00
Girard Point	RFD	Unit 433 KOH Treater Lines	2008	0.01	0.19	0.01	0.19	0.05
Point Breeze	RFD	Unit 866 Stripper Valve	2008	0.30	0.06	0.00	0.06	0.04
Point Breeze	08255	Unit 865 Improvement Project	2009	0.97	9.42	0.00	9.42	5.94
Girard Point	09022	Unit 137 RFG Changes	2009	0.02	0.00	0.00	0.00	0.00
Girard Point	09116	Unit 433 ASO to Unit 137 Desalter	2009	0.02	0.00	0.00	0.00	0.00
Marcus Hook	Pa23-0001AA	12 - 3 New Cooling Tower 10/28/2009	10/28/2009	0.00	0.00	-0.40	0.00	0.00
Girard Point	09040	Unit 1332 Heater SEP	2010	0.03	0.87	0.04	0.87	0.23
Point Breeze	non permit letter	Tk 33/35 Jump-over line	2010	0.03	0.00	0.00	0.00	0.00
Gir. Pt./Pt. Br.	Application	Butane Truck Unloading at SRTF	January 2013	0.26	0.09	0.00	0.09	0.00
Gir. Pt./Pt. Br.	RFD	3-Unit Train - Crude Transfer Pipeline	January 2013	0.004	0.00	0.00	0.00	0.00
Gir. Pt./Pt. Br.	RFD	14-Unit Train - Crude Transfer Pipeline	January 2013	0.05	0.00	0.00	0.00	0.00
Point Breeze	Application	Tank P-590 (PB 843) Reactivation	January 2013	1.24	0.00	0.00	0.00	0.00
5-calendar year increases from 1st Quarter 2013 (PES/Marcus Hook)				2.62	10.39	---	---	---
10-year increases/decreases from 1st Quarter 2013 (PES/Marcus Hook)				22.32	34.63	---	---	---
5-year increases/decreases from 1st Quarter 2013 (PES/Marcus Hook)				---	---	7.16	10.63	49.47

Notes:

Plan Approval 04237 triggered NSR for VOC.

Plan Approval 06144 triggered NSR for VOC & NO_x.

NSR contemporaneous period for VOC and NO_x is 5 calendar years (the year of modification plus back 4 more years).

PM_{2.5} contemporaneous period is assumed to start from 2005, the year of non-attainment status.

Under 51 CFR Appendix S, netting analysis for PM_{2.5} only required if project itself leads to a significant increase.

* No. 3 BH PM_{2.5} reduction may be bankable to an ERC after SIP rule change. Will need PM_{2.5} factor from a surrogate unit test to determine the value.

Consent Decree does not allow NO_x reduction within the No. 3 Boiler House Project.

Tank P-590 (PB 843) includes emissions from steam from No. 3 Boiler House that were already permitted in No. 3 Boiler House NO_x Reduction Project in 2008.

PES Refinery

Heater Firing Rate Increase Plan Approval

Summary of Contemporaneous Period Emissions

Facility	Permit No.	Activity	Effective Date of Change	PSD Net Emission Change, Ton/Yr						
				NO ₂	SO ₂	PM/PM ₁₀	CO	H ₂ SO ₄	Lead	CO ₂ e
Point Breeze	06144	859 ULSD Project ¹	1/29/08	note 3	43.21	7.58	88.57	n/a		
Girard Point	08080	No. 3 Boiler House NO _x Reduction ²	9/9/08	n/a	na	na	82.40	n/a		
Girard Point	RFD	Unit 433 KOH Treater Lines	10/23/08	0.19	0.05	0.01	0.10	n/a		
Point Breeze	RFD	Unit 866 Stripper Valve	12/22/08	0.06	0.04	0.00	0.04	n/a		
Point Breeze	08255	Unit 865 Improvement Project	2/23/09	9.42	5.94	0.27	12.01	n/a		
Girard Point	09022	Unit 137 RFG Changes	3/3/09	0.00	0.00	0.00	0.00	n/a		
Girard Point	09116	Unit 433 ASO to Unit 137 Desalter	6/5/09	0.00	0.00	0.00	0.00	n/a		
Girard Point	09040	Unit 1332 Heater SEP	2/1/10	0.87	0.23	0.04	0.48	2.75		
Marcus Hook	Pa23-0001AD	CO controls for 6 WWTA diesels	5/17/2012	0.00	0.00	0.00	-1.65	0.00	0.00	0.00
Gir. Pt./Pt. Br.	Application	Butane Truck Unloading at SRTF	January 2013	0.09	0.00	0.00	0.51	0.00	0.00	0.00
Gir. Pt./Pt. Br.	RFD	3-Unit Train - Crude Transfer Pipeline	January 2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gir. Pt./Pt. Br.	RFD	14-Unit Train - Crude Transfer Pipeline	January 2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Point Breeze	Application	Tank P-590 (PB 843) Reactivation ³	January 2013	0.27	0.18	0.05	0.45	0.00	0.00	0.00
5-year increases and decreases from 1st Quarter 2013 (PES/Marcus Hook)				10.90	49.65	7.96	182.90	2.75	0.00	0

Notes:

1 The 859 project triggered PSD review for NO₂. Net emission increases for this pollutant were reset with ambient air quality modeling.

Net* = Past five years (date of startup of new project back to date 5 years prior to start of construction, or back to last major PSD permit).

H₂SO₄ is an issue with SCR installation due to small conversion of SO₂ to SO₃ and hydrolyzation to H₂SO₄

2 SO₂ and PM reductions per No. 3 BH Consent Decree are not allowable as PSD/NSR credits

3 Tank P-590 (PB 843) includes emissions from steam from No. 3 Boiler House that were already permitted in No. 3 Boiler House NO_x Reduction Project in 2008.

Facility	Permit No.	Source	Effective Date	Emission Reduction Credits, Tons						
				VOC	NO _x /NO ₂	SO ₂	PM/PM ₁₀ /PM _{2.5}	CO	H ₂ SO ₄	CO ₂ e
Marcus Hook	non permit letter	15-1 CRUDE HTR shutdown	2012	-5.05	-136.46	-0.15	-7.02	-77.24	n/a	-111,102
Marcus Hook	non permit letter	17-2A H-01, H-02, H-03 HTR shutdown	2012	-2.72	-57.04	-0.05	-3.75	-41.19	n/a	-44,912
Marcus Hook	non permit letter	17-2A H-04 HTR shutdown	2012	-0.35	-6.21	-0.01	-0.50	-5.25	n/a	-8,250
Marcus Hook	non permit letter	12-3 CRUDE HTR H-3006 shutdown	2012	-4.61	-89.48	-0.13	-6.36	-70.37	n/a	-92,084
Marcus Hook	non permit letter	12-3 DESULF HTR	2012	-0.33	-6.06	-0.01	-0.48	-5.09	n/a	-4,819
Marcus Hook	non permit letter	111 Cooling Towers	2012	-19.94	0.00	0.00	-10.24	0.00	n/a	0
Point Breeze	non permit letter	22 Boilerhouse #2	2010	-0.54	-17.88	-0.70	-0.76	-0.15	n/a	-49,788
Total ERCs Generated				-33.52	-313.11	-1.05	-29.10	-199.27	-56.07	-310,956
PSD 5-year review netting credits required				---	-95.10	---	---	-199.27	---	-181,045
Ozone NA-NSR 5-calendar year review netting credits required				---	-173.66	---	---	---	---	---
Ozone NA-NSR 10-year review netting credits required				-10.82	-133.82	---	---	---	---	---
PM2.5 NA-NSR 5-year review netting credits required				---	-94.83	---	-8.86	---	---	---
PSD/NSR maximum netting credits needed in the Heater Plan Approval Application				-10.82	-173.66	0.00	-8.86	-199.27	---	-181,045
Total ERCs Remaining after Heater Plan Approval				-22.70	-139.46	-1.05	-20.23	0.00	-56.07	-129,911

PES Refinery

Heater Firing Rate Increase Plan Approval

Emission Estimates for Target Heaters with Proposed Increases in Firing Limits

Source	Emissions	Calculation	PM (TPY)	PM ₁₀ (TPY)	PM _{2.5} (TPY)	CO (TPY)	VOC (TPY)	NO _x (TPY)	SO ₂ (TPY)	Lead (TPY)	CO _{2e} (TPY)
Unit 137 F-1	(A) Baseline Actual Emissions, 2010-2011 (TPY)	See "Heater Monthly Emissions" tab	10.8	10.8	10.8	119.0	7.8	194.7	4.5	7.1E-04	170,357
	(B) Projected Actual Emissions (TPY)	See "Unit 137 F-1 - Proj. Actual" tab	13.6	13.6	13.6	150.5	9.9	231.7	6.6	9.0E-04	215,450
	(C) Baseline Increases (TPY)	(C) = (B) - (A)	2.8	2.8	2.8	31.5	2.1	37.0	2.1	1.9E-04	45,092
	(D) Capable Emissions (TPY)	See "Unit 137 F-1 - Capable" tab	12.5	12.5	12.5	137.7	9.0	212.1	6.0	8.2E-04	197,217
	(E) Capable Increases from Baseline (TPY)	(E) = (D) - (A)	1.7	1.7	1.7	18.8	1.2	17.4	1.5	1.1E-04	26,860
	(F) Plan Approval Emissions Increase (TPY)	(F) = (C) - (E)	1.2	1.2	1.2	12.7	0.8	19.6	0.6	7.6E-05	18,232
Unit 231-B101	(A) Baseline Actual Emissions, 2010-2011 (TPY)	See "Heater Monthly Emissions" tab	1.7	1.7	1.7	18.5	1.2	28.1	0.4	1.1E-04	26,515
	(B) Projected Actual Emissions (TPY)	See "Unit 231 B101 - Proj. Actual" tab	3.1	3.1	3.1	34.4	2.3	52.2	1.0	2.0E-04	49,253
	(C) Baseline Increases (TPY)	(C) = (B) - (A)	1.4	1.4	1.4	15.9	1.0	24.1	0.6	9.5E-05	22,738
	(D) Capable Emissions (TPY)	See "Unit 231 B101 - Capable" tab	1.8	1.8	1.8	20.4	1.3	31.0	0.6	1.2E-04	29,259
	(E) Capable Increases from Baseline (TPY)	(E) = (D) - (A)	0.2	0.2	0.2	1.9	0.1	2.9	0.2	1.1E-05	2,744
	(F) Plan Approval Emissions Increase (TPY)	(F) = (C) - (E)	1.3	1.3	1.3	14.0	0.9	21.2	0.4	8.3E-05	19,995
Unit 865-11H1	(A) Baseline Actual Emissions, 2010-2011 (TPY)	See "Heater Monthly Emissions" tab	1.7	1.7	1.7	18.9	1.2	26.2	0.3	1.1E-04	27,003
	(B) Projected Actual Emissions (TPY)	See "Unit 865 11H1 - Proj. Actual" tab	2.6	2.6	2.6	28.5	1.9	39.5	0.2	1.7E-04	40,777
	(C) Baseline Increases (TPY)	(C) = (B) - (A)	0.9	0.9	0.9	9.6	0.6	13.3	-0.1	5.7E-05	13,774
	(D) Capable Emissions (TPY)	See "Unit 865 11H1 - Capable" tab	2.1	2.1	2.1	23.4	1.5	32.4	0.2	1.4E-04	33,451
	(E) Capable Increases from Baseline (TPY)	(E) = (D) - (A)	0.4	0.4	0.4	4.5	0.3	6.2	-0.1	2.7E-05	6,448
	(F) Plan Approval Emissions Increase (TPY)	(F) = (C) - (E)	0.5	0.5	0.5	5.1	0.3	7.1	-0.1	3.0E-05	7,326
Unit 865-11H2	(A) Baseline Actual Emissions, 2010-2011 (TPY)	See "Heater Monthly Emissions" tab	1.3	1.3	1.3	14.1	0.9	19.5	0.2	8.4E-05	20,131
	(B) Projected Actual Emissions (TPY)	See "Unit 865 11H2 - Proj. Actual" tab	1.8	1.8	1.8	20.4	1.3	28.3	0.2	1.2E-04	29,168
	(C) Baseline Increases (TPY)	(C) = (B) - (A)	0.6	0.6	0.6	6.3	0.4	8.8	0.0	3.8E-05	9,038
	(D) Capable Emissions (TPY)	See "Unit 865 11H2 - Capable" tab	1.5	1.5	1.5	16.7	1.1	23.2	0.2	9.9E-05	23,909
	(E) Capable Increases from Baseline (TPY)	(E) = (D) - (A)	0.2	0.2	0.2	2.6	0.2	3.7	-0.1	1.6E-05	3,778
	(F) Plan Approval Emissions Increase (TPY)	(F) = (C) - (E)	0.3	0.3	0.3	3.7	0.2	5.1	0.0	2.2E-05	5,260
Unit 210-H101	(A) Baseline Actual Emissions, 2010-2011 (TPY)	See "Heater Monthly Emissions" tab	5.2	5.2	5.2	56.9	3.7	62.2	1.6	3.4E-04	81,546
	(B) Projected Actual Emissions (TPY)	See "Unit 210 H101 - Proj. Actual"	6.1	6.1	6.1	66.9	4.4	73.1	1.8	4.0E-04	95,847
	(C) Baseline Increases (TPY)	(C) = (B) - (A)	0.9	0.9	0.9	10.0	0.7	11.0	0.2	5.9E-05	14,301
	(D) Capable Emissions (TPY)	See "Unit 210 H101 - Capable" tab	5.5	5.5	5.5	60.8	4.0	66.4	1.6	3.6E-04	86,993
	(E) Capable Increases from Baseline (TPY)	(E) = (D) - (A)	0.3	0.3	0.3	3.8	0.2	4.2	0.0	2.3E-05	5,448
	(F) Plan Approval Emissions Increase (TPY)	(F) = (C) - (E)	0.6	0.6	0.6	6.2	0.4	6.8	0.2	3.7E-05	8,853
Unit 210-H201	(A) Baseline Actual Emissions, 2010-2011 (TPY)	See "Heater Monthly Emissions" tab	5.9	5.9	5.9	65.1	4.3	20.0	1.7	3.9E-04	93,174
	(B) Projected Actual Emissions (TPY)	See "Unit 210 H201 - Proj. Actual" tab	8.0	8.0	8.0	88.5	5.8	32.6	2.0	5.3E-04	126,707
	(C) Baseline Increases (TPY)	(C) = (B) - (A)	2.1	2.1	2.1	23.4	1.5	12.6	0.3	1.4E-04	33,532
	(D) Capable Emissions (TPY)	See "Unit 210 H201 - Capable" tab	7.4	7.4	7.4	81.9	5.4	30.1	1.9	4.9E-04	117,238
	(E) Capable Increases from Baseline (TPY)	(E) = (D) - (A)	1.5	1.5	1.5	16.8	1.1	10.1	0.2	1.0E-04	24,064
	(F) Plan Approval Emissions Increase (TPY)	(F) = (C) - (E)	0.6	0.6	0.6	6.6	0.4	2.4	0.2	3.9E-05	9,468
Unit 866-12H1	(A) Baseline Actual Emissions, 2010-2011 (TPY)	See "Heater Monthly Emissions" tab	0.6	0.6	0.6	6.6	0.4	9.1	0.2	3.9E-05	9,446
	(B) Projected Actual Emissions (TPY)	See "Unit 866 12H1 - Proj. Actual" tab	1.7	1.7	1.7	18.6	1.2	25.8	0.2	1.1E-04	26,601
	(C) Baseline Increases (TPY)	(C) = (B) - (A)	1.1	1.1	1.1	12.0	0.8	16.6	0.1	7.1E-05	17,156
	(D) Capable Emissions (TPY)	See "Unit 866 12H1 - Capable" tab	0.8	0.8	0.8	8.7	0.6	12.0	0.1	5.2E-05	12,428
	(E) Capable Increases from Baseline (TPY)	(E) = (D) - (A)	0.2	0.2	0.2	2.1	0.1	2.9	0.0	1.2E-05	2,983
	(F) Plan Approval Emissions Increase (TPY)	(F) = (C) - (E)	0.9	0.9	0.9	9.9	0.6	13.7	0.1	5.9E-05	14,173
Unit 868-8H101	(A) Baseline Actual Emissions, 2010-2011 (TPY)	See "Heater Monthly Emissions" tab	1.2	1.2	1.2	13.2	0.9	19.0	0.4	7.8E-05	18,877
	(B) Projected Actual Emissions (TPY)	See "Unit 868 8H101 - Proj. Actual" tab	1.7	1.7	1.7	18.9	1.2	27.1	0.7	1.1E-04	27,054
	(C) Baseline Increases (TPY)	(C) = (B) - (A)	0.5	0.5	0.5	5.7	0.4	8.1	0.3	3.4E-05	8,177
	(D) Capable Emissions (TPY)	See "Unit 868 8H101 - Capable" tab	1.5	1.5	1.5	16.9	1.1	24.3	0.6	1.0E-04	24,246
	(E) Capable Increases from Baseline (TPY)	(E) = (D) - (A)	0.3	0.3	0.3	3.7	0.2	5.3	0.2	2.2E-05	5,369
	(F) Plan Approval Emissions Increase (TPY)	(F) = (C) - (E)	0.2	0.2	0.2	2.0	0.1	2.8	0.1	1.2E-05	2,808
Total	(A) Baseline Actual Emissions, 2010-2011 (TPY)	Sum of all (A) rows above	28.2	28.2	28.2	312.2	20.4	378.8	9.4	1.9E-03	447,049
	(B) Projected Actual Emissions (TPY)	Sum of all (B) rows above	38.6	38.6	38.6	426.6	27.9	510.2	12.8	2.5E-03	610,858
	(C) Baseline Increases (TPY)	Sum of all (C) rows above	10.4	10.4	10.4	114.4	7.5	131.4	3.4	6.8E-04	163,809
	(D) Capable Emissions (TPY)	Sum of all (D) rows above	33.2	33.2	33.2	366.5	24.0	431.5	11.2	2.2E-03	524,742
	(E) Capable Increases from Baseline (TPY)	Sum of all (E) rows above	4.9	4.9	4.9	54.3	3.6	52.7	1.9	3.2E-04	77,693
	(F) Plan Approval Emissions Increase (TPY)	Sum of all (F) rows above	5.4	5.4	5.4	60.1	3.9	78.7	1.3	3.6E-04	86,115

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 137 F-1 Heater Projected Actual Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 137 F-1 Heater Current Firing Rate Limit	= 415.00	MMBtu/hr	
[B]	Unit 137 F-1 Heater Future Annual Average Firing Rate	= 430.00	MMBtu/hr	
[C]	Unit 137 F-1 Heater Future Hourly Maximum Firing Rate	= 460.00	MMBtu/hr	
[D]	Projected Maximum Annual Firing Rate	= 3,767,000	MMBtu/yr	= [B] * 8760 (Rounded to nearest thousand MMBtu)
[E]	Higher heating value of fuel gas	= 1,051.5	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0035	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.123	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ Projected Actual Emissions	= 6.6	tpy	= [D] * [F] / 2000
[N]	NO _x Projected Actual Emissions	= 231.7	tpy	= [D] * [G] / 2000
[O]	PM Projected Actual Emissions	= 13.6	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ Projected Actual Emissions	= 13.6	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} Projected Actual Emissions	= 13.6	tpy	= [D] * [J] / [E] / 2000
[R]	CO Projected Actual Emissions	= 150.5	tpy	= [D] * [K] / [E] / 2000
[S]	VOC Projected Actual Emissions	= 9.9	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= [T] * [W] / 1,000,000 * [E]		
[Y]	Adjusted CH ₄ EF	= [U] * [W] / 1,000,000 * [E]		
[Z]	Adjusted N ₂ O EF	= [V] * [W] / 1,000,000 * [E]		
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO ₂ e Projected Actual Emissions	= 215,450	tpy CO ₂ e	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead Projected Actual Emissions	= 9.0E-04	tpy	= [D] * [AD] / [E] / 2000
[AF]	SO ₂ maximum hourly	= 1.6	lb/hr	= [C] * [F]
[AG]	NO _x maximum hourly	= 56.6	lb/hr	= [C] * [G]
[AH]	PM maximum hourly	= 3.3	lb/hr	= [C] * [H] / [E]
[AI]	PM ₁₀ maximum hourly	= 3.3	lb/hr	= [C] * [I] / [E]
[AJ]	PM _{2.5} maximum hourly	= 3.3	lb/hr	= [C] * [J] / [E]
[AK]	CO maximum hourly	= 36.7	lb/hr	= [C] * [K] / [E]
[AL]	VOC maximum hourly	= 2.4	lb/hr	= [C] * [L] / [E]
[AM]	Lead maximum hourly	= 2.2E-04	lb/hr	= [C] * [AD] / [E]

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 137 F-1 Heater Capable of Accommodating Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 137 F-1 Heater Current Firing Rate Limit	= 415.00	MMBtu/hr	
[B]	Unit 137 F-1 Heater Maximum Monthly Firing Rate	= 287,352	MMBtu/month	2010 and 2011 period
[C]	Unit 137 F-1 Heater Maximum Monthly Firing Rate	= 386.23	MMBtu/hr	2010 and 2011 period
[D]	Annual Firing Rate Projected from Maximum Monthly Rate	= 3,448,223	MMBtu/yr	= [B] * 12
[E]	Higher heating value of fuel gas	= 1,051.5	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0035	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.123	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ PTE	= 6.0	tpy	= [D] * [F] / 2000
[N]	NO _x PTE	= 212.1	tpy	= [D] * [G] / 2000
[O]	PM PTE	= 12.5	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ PTE	= 12.5	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} PTE	= 12.5	tpy	= [D] * [J] / [E] / 2000
[R]	CO PTE	= 137.7	tpy	= [D] * [K] / [F] / 2000
[S]	VOC PTE	= 9.0	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= 51.83	kg/MMBtu	= [T] * [W] / 1,000,000 * [E]
[Y]	Adjusted CH ₄ EF	= 0.001	kg/MMBtu	= [U] * [W] / 1,000,000 * [E]
[Z]	Adjusted N ₂ O EF	= 0.0001	kg/MMBtu	= [V] * [W] / 1,000,000 * [E]
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO ₂ e Projected Actual Emissions	= 197,217	tpy CO ₂ e	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead PTE	= 8.2E-04	tpy	= [D] * [AD] / [E] / 2000

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 231 B101 Heater Projected Actual Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 231 B101 Heater Current Firing Rate Limit	= 91.00	MMBtu/hr	
[B]	Unit 231 B101 Heater Future Annual Average Firing Rate	= 97.75	MMBtu/hr	
[C]	Unit 231 B101 Heater Future Hourly Maximum Firing Rate	= 104.50	MMBtu/hr	
[D]	Projected Maximum Annual Firing Rate	= 856,000	MMBtu/yr	= [B] * 8760 (Rounded to nearest thousand MMBtu)
[E]	Higher heating value of fuel gas	= 1,045.2	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0024	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.122	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ Projected Actual Emissions	= 1.0	tpy	= [D] * [F] / 2000
[N]	NO _x Projected Actual Emissions	= 52.2	tpy	= [D] * [G] / 2000
[O]	PM Projected Actual Emissions	= 3.1	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ Projected Actual Emissions	= 3.1	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} Projected Actual Emissions	= 3.1	tpy	= [D] * [J] / [E] / 2000
[R]	CO Projected Actual Emissions	= 34.4	tpy	= [D] * [K] / [E] / 2000
[S]	VOC Projected Actual Emissions	= 2.3	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= [T] * [W] / 1,000,000 * [E]		
[Y]	Adjusted CH ₄ EF	= [U] * [W] / 1,000,000 * [E]		
[Z]	Adjusted N ₂ O EF	= [V] * [W] / 1,000,000 * [E]		
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO ₂ e Projected Actual Emissions	= 49,253	tpy CO ₂ e	= ([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB]) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead Projected Actual Emissions	= 2.0E-04	tpy	= [D] * [AD] / [E] / 2000
[AF]	SO ₂ maximum hourly	= 0.2	lb/hr	= [C] * [F]
[AG]	NO _x maximum hourly	= 12.7	lb/hr	= [C] * [G]
[AH]	PM maximum hourly	= 0.8	lb/hr	= [C] * [H] / [E]
[AI]	PM ₁₀ maximum hourly	= 0.8	lb/hr	= [C] * [I] / [E]
[AJ]	PM _{2.5} maximum hourly	= 0.8	lb/hr	= [C] * [J] / [E]
[AK]	CO maximum hourly	= 8.4	lb/hr	= [C] * [K] / [E]
[AL]	VOC maximum hourly	= 0.5	lb/hr	= [C] * [L] / [E]
[AM]	Lead maximum hourly	= 5.0E-05	lb/hr	= [C] * [AD] / [E]

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 231 B101 Heater Capable of Accommodating Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 231 B101 Heater Current Firing Rate Limit	= 91.00	MMBtu/hr	
[B]	Unit 231 B101 Heater Maximum Monthly Firing Rate	= 42,375	MMBtu/month	2010 and 2011 period
[C]	Unit 231 B101 Heater Maximum Monthly Firing Rate	= 56.96	MMBtu/hr	2010 and 2011 period
[D]	Annual Firing Rate Projected from Maximum Monthly Rate	= 508,503	MMBtu/yr	= [B] * 12
[E]	Higher heating value of fuel gas	= 1,045.2	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0024	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.122	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ PTE	= 0.6	tpy	= [D] * [F] / 2000
[N]	NO _x PTE	= 31.0	tpy	= [D] * [G] / 2000
[O]	PM PTE	= 1.8	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ PTE	= 1.8	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} PTE	= 1.8	tpy	= [D] * [J] / [E] / 2000
[R]	CO PTE	= 20.4	tpy	= [D] * [K] / [F] / 2000
[S]	VOC PTE	= 1.3	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= 52.15	kg/MMBtu	= [T] * [W] / 1,000,000 * [E]
[Y]	Adjusted CH ₄ EF	= 0.001	kg/MMBtu	= [U] * [W] / 1,000,000 * [E]
[Z]	Adjusted N ₂ O EF	= 0.0001	kg/MMBtu	= [V] * [W] / 1,000,000 * [E]
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO ₂ e Projected Actual Emissions	= 29,259	tpy CO ₂ e	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead PTE	= 1.2E-04	tpy	= [D] * [AD] / [E] / 2000

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 865 11H1 Heater Projected Actual Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 865 11H1 Heater Current Firing Rate Limit	= 72.20	MMBtu/hr	
[B]	Unit 865 11H1 Heater Future Annual Average Firing Rate	= 79.75	MMBtu/hr	
[C]	Unit 865 11H1 Heater Future Hourly Maximum Firing Rate	= 87.30	MMBtu/hr	
[D]	Projected Maximum Annual Firing Rate	= 699,000	MMBtu/yr	= [B] * 8760 (Rounded to nearest thousand MMBtu)
[E]	Higher heating value of fuel gas	= 1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0007	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.113	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ Projected Actual Emissions	= 0.2	tpy	= [D] * [F] / 2000
[N]	NO _x Projected Actual Emissions	= 39.5	tpy	= [D] * [G] / 2000
[O]	PM Projected Actual Emissions	= 2.6	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ Projected Actual Emissions	= 2.6	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} Projected Actual Emissions	= 2.6	tpy	= [D] * [J] / [E] / 2000
[R]	CO Projected Actual Emissions	= 28.5	tpy	= [D] * [K] / [E] / 2000
[S]	VOC Projected Actual Emissions	= 1.9	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= [T] * [W] / 1,000,000 * [E]		
[Y]	Adjusted CH ₄ EF	= [U] * [W] / 1,000,000 * [E]		
[Z]	Adjusted N ₂ O EF	= [V] * [W] / 1,000,000 * [E]		
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO _{2e} Projected Actual Emissions	= 40,777	tpy CO _{2e}	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead Projected Actual Emissions	= 1.7E-04	tpy	= [D] * [AD] / [E] / 2000
[AF]	SO ₂ maximum hourly	= 0.1	lb/hr	= [C] * [F]
[AG]	NO _x maximum hourly	= 9.9	lb/hr	= [C] * [G]
[AH]	PM maximum hourly	= 0.6	lb/hr	= [C] * [H] / [E]
[AI]	PM ₁₀ maximum hourly	= 0.6	lb/hr	= [C] * [I] / [E]
[AJ]	PM _{2.5} maximum hourly	= 0.6	lb/hr	= [C] * [J] / [E]
[AK]	CO maximum hourly	= 7.1	lb/hr	= [C] * [K] / [E]
[AL]	VOC maximum hourly	= 0.5	lb/hr	= [C] * [L] / [E]
[AM]	Lead maximum hourly	= 4.2E-05	lb/hr	= [C] * [AD] / [E]

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 865 11H1 Heater Capable of Accommodating Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 865 11H1 Heater Current Firing Rate Limit	= 72.20	MMBtu/hr	
[B]	Unit 865 11H1 Heater Maximum Monthly Firing Rate	= 47,785	MMBtu/month	2010 and 2011 period
[C]	Unit 865 11H1 Heater Maximum Monthly Firing Rate	= 64.23	MMBtu/hr	2010 and 2011 period
[D]	Annual Firing Rate Projected from Maximum Monthly Rate	= 573,421	MMBtu/yr	= [B] * 12
[E]	Higher heating value of fuel gas	= 1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0007	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.113	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ PTE	= 0.2	tpy	= [D] * [F] / 2000
[N]	NO _x PTE	= 32.4	tpy	= [D] * [G] / 2000
[O]	PM PTE	= 2.1	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ PTE	= 2.1	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} PTE	= 2.1	tpy	= [D] * [J] / [E] / 2000
[R]	CO PTE	= 23.4	tpy	= [D] * [K] / [F] / 2000
[S]	VOC PTE	= 1.5	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= 52.87	kg/MMBtu	= [T] * [W] / 1,000,000 * [E]
[Y]	Adjusted CH ₄ EF	= 0.001	kg/MMBtu	= [U] * [W] / 1,000,000 * [E]
[Z]	Adjusted N ₂ O EF	= 0.0001	kg/MMBtu	= [V] * [W] / 1,000,000 * [E]
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO ₂ e Projected Actual Emissions	= 33,451	tpy CO ₂ e	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead PTE	= 1.4E-04	tpy	= [D] * [AD] / [E] / 2000

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 865 11H2 Heater Projected Actual Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 865 11H2 Heater Current Firing Rate Limit	= 49.90	MMBtu/hr	
[B]	Unit 865 11H2 Heater Future Annual Average Firing Rate	= 57.05	MMBtu/hr	
[C]	Unit 865 11H2 Heater Future Hourly Maximum Firing Rate	= 64.20	MMBtu/hr	
[D]	Projected Maximum Annual Firing Rate	= 500,000	MMBtu/yr	= [B] * 8760 (Rounded to nearest thousand MMBtu)
[E]	Higher heating value of fuel gas	= 1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0008	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.113	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ Projected Actual Emissions	= 0.2	tpy	= [D] * [F] / 2000
[N]	NO _x Projected Actual Emissions	= 28.3	tpy	= [D] * [G] / 2000
[O]	PM Projected Actual Emissions	= 1.8	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ Projected Actual Emissions	= 1.8	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} Projected Actual Emissions	= 1.8	tpy	= [D] * [J] / [E] / 2000
[R]	CO Projected Actual Emissions	= 20.4	tpy	= [D] * [K] / [E] / 2000
[S]	VOC Projected Actual Emissions	= 1.3	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= [T] * [W] / 1,000,000 * [E]		
[Y]	Adjusted CH ₄ EF	= [U] * [W] / 1,000,000 * [E]		
[Z]	Adjusted N ₂ O EF	= [V] * [W] / 1,000,000 * [E]		
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO _{2e} Projected Actual Emissions	= 29,168	tpy CO _{2e}	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead Projected Actual Emissions	= 1.2E-04	tpy	= [D] * [AD] / [E] / 2000
[AF]	SO ₂ maximum hourly	= 0.1	lb/hr	= [C] * [F]
[AG]	NO _x maximum hourly	= 7.3	lb/hr	= [C] * [G]
[AH]	PM maximum hourly	= 0.5	lb/hr	= [C] * [H] / [E]
[AI]	PM ₁₀ maximum hourly	= 0.5	lb/hr	= [C] * [I] / [E]
[AJ]	PM _{2.5} maximum hourly	= 0.5	lb/hr	= [C] * [J] / [E]
[AK]	CO maximum hourly	= 5.2	lb/hr	= [C] * [K] / [E]
[AL]	VOC maximum hourly	= 0.3	lb/hr	= [C] * [L] / [E]
[AM]	Lead maximum hourly	= 3.1E-05	lb/hr	= [C] * [AD] / [E]

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 865 11H2 Heater Capable of Accommodating Emissions Analysis

ID	Parameter		Value	Units	Source / Basis
[A]	Unit 865 11H2 Heater Current Firing Rate Limit	=	49.90	MMBtu/hr	
[B]	Unit 865 11H2 Heater Maximum Monthly Firing Rate	=	34,153	MMBtu/month	2010 and 2011 period
[C]	Unit 865 11H2 Heater Maximum Monthly Firing Rate	=	45.91	MMBtu/hr	2010 and 2011 period
[D]	Annual Firing Rate Projected from Maximum Monthly Rate	=	409,841	MMBtu/yr	= [B] * 12
[E]	Higher heating value of fuel gas	=	1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	=	0.0008	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	=	0.113	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	=	7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	=	7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	=	7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	=	84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	=	5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ PTE	=	0.2	tpy	= [D] * [F] / 2000
[N]	NO _x PTE	=	23.2	tpy	= [D] * [G] / 2000
[O]	PM PTE	=	1.5	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ PTE	=	1.5	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} PTE	=	1.5	tpy	= [D] * [J] / [E] / 2000
[R]	CO PTE	=	16.7	tpy	= [D] * [K] / [F] / 2000
[S]	VOC PTE	=	1.1	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	=	53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	=	0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	=	0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	=	0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	=	52.87	kg/MMBtu	= [T] * [W] / 1,000,000 * [E]
[Y]	Adjusted CH ₄ EF	=	0.001	kg/MMBtu	= [U] * [W] / 1,000,000 * [E]
[Z]	Adjusted N ₂ O EF	=	0.0001	kg/MMBtu	= [V] * [W] / 1,000,000 * [E]
[AA]	CH ₄ Global Warming Potential	=	21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	=	310		40 CFR 98 Table A-1
[AC]	CO _{2e} Projected Actual Emissions	=	23,909	tpy CO _{2e}	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	=	0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead PTE	=	9.9E-05	tpy	= [D] * [AD] / [E] / 2000

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 210 H101 Heater Projected Actual Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 210 H101 Heater Current Firing Rate Limit	= 183.00	MMBtu/hr	
[B]	Unit 210 H101 Heater Future Annual Average Firing Rate	= 187.50	MMBtu/hr	
[C]	Unit 210 H101 Heater Future Hourly Maximum Firing Rate	= 192.00	MMBtu/hr	
[D]	Projected Maximum Annual Firing Rate	= 1,643,000	MMBtu/yr	= [B] * 8760 (Rounded to nearest thousand MMBtu)
[E]	Higher heating value of fuel gas	= 1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0022	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.089	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ Projected Actual Emissions	= 1.8	tpy	= [D] * [F] / 2000
[N]	NO _x Projected Actual Emissions	= 73.1	tpy	= [D] * [G] / 2000
[O]	PM Projected Actual Emissions	= 6.1	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ Projected Actual Emissions	= 6.1	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} Projected Actual Emissions	= 6.1	tpy	= [D] * [J] / [E] / 2000
[R]	CO Projected Actual Emissions	= 66.9	tpy	= [D] * [K] / [E] / 2000
[S]	VOC Projected Actual Emissions	= 4.4	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= [T] * [W] / 1,000,000 * [E]		
[Y]	Adjusted CH ₄ EF	= [U] * [W] / 1,000,000 * [E]		
[Z]	Adjusted N ₂ O EF	= [V] * [W] / 1,000,000 * [E]		
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO _{2e} Projected Actual Emissions	= 95,847	tpy CO _{2e}	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead Projected Actual Emissions	= 4.0E-04	tpy	= [D] * [AD] / [E] / 2000
[AF]	SO ₂ maximum hourly	= 0.4	lb/hr	= [C] * [F]
[AG]	NO _x maximum hourly	= 17.1	lb/hr	= [C] * [G]
[AH]	PM maximum hourly	= 1.4	lb/hr	= [C] * [H] / [E]
[AI]	PM ₁₀ maximum hourly	= 1.4	lb/hr	= [C] * [I] / [E]
[AJ]	PM _{2.5} maximum hourly	= 1.4	lb/hr	= [C] * [J] / [E]
[AK]	CO maximum hourly	= 15.6	lb/hr	= [C] * [K] / [E]
[AL]	VOC maximum hourly	= 1.0	lb/hr	= [C] * [L] / [E]
[AM]	Lead maximum hourly	= 9.3E-05	lb/hr	= [C] * [AD] / [E]

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 210 H101 Heater Capable of Accommodating Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 210 H101 Heater Current Firing Rate Limit	= 183.00	MMBtu/hr	
[B]	Unit 210 H101 Heater Maximum Monthly Firing Rate	= 124,270	MMBtu/month	2010 and 2011 period
[C]	Unit 210 H101 Heater Maximum Monthly Firing Rate	= 167.03	MMBtu/hr	2010 and 2011 period
[D]	Annual Firing Rate Projected from Maximum Monthly Rate	= 1,491,237	MMBtu/yr	= [B] * 12
[E]	Higher heating value of fuel gas	= 1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0022	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.089	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ PTE	= 1.6	tpy	= [D] * [F] / 2000
[N]	NO _x PTE	= 66.4	tpy	= [D] * [G] / 2000
[O]	PM PTE	= 5.5	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ PTE	= 5.5	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} PTE	= 5.5	tpy	= [D] * [J] / [E] / 2000
[R]	CO PTE	= 60.8	tpy	= [D] * [K] / [F] / 2000
[S]	VOC PTE	= 4.0	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= 52.87	kg/MMBtu	= [T] * [W] / 1,000,000 * [E]
[Y]	Adjusted CH ₄ EF	= 0.001	kg/MMBtu	= [U] * [W] / 1,000,000 * [E]
[Z]	Adjusted N ₂ O EF	= 0.0001	kg/MMBtu	= [V] * [W] / 1,000,000 * [E]
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO ₂ e Projected Actual Emissions	= 86,993	tpy CO ₂ e	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead PTE	= 3.6E-04	tpy	= [D] * [AD] / [E] / 2000

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 210 H201 Heater Projected Actual Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 210 H201 Heater Current Firing Rate Limit	= 242.00	MMBtu/hr	
[B]	Unit 210 H201 Heater Future Annual Average Firing Rate	= 248.00	MMBtu/hr	
[C]	Unit 210 H201 Heater Future Hourly Maximum Firing Rate	= 254.00	MMBtu/hr	
[D]	Projected Maximum Annual Firing Rate	= 2,172,000	MMBtu/yr	= [B] * 8760 (Rounded to nearest thousand MMBtu)
[E]	Higher heating value of fuel gas	= 1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0019	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.030	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ Projected Actual Emissions	= 2.0	tpy	= [D] * [F] / 2000
[N]	NO _x Projected Actual Emissions	= 32.6	tpy	= [D] * [G] / 2000
[O]	PM Projected Actual Emissions	= 8.0	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ Projected Actual Emissions	= 8.0	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} Projected Actual Emissions	= 8.0	tpy	= [D] * [J] / [E] / 2000
[R]	CO Projected Actual Emissions	= 88.5	tpy	= [D] * [K] / [E] / 2000
[S]	VOC Projected Actual Emissions	= 5.8	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= [T] * [W] / 1,000,000 * [E]		
[Y]	Adjusted CH ₄ EF	= [U] * [W] / 1,000,000 * [E]		
[Z]	Adjusted N ₂ O EF	= [V] * [W] / 1,000,000 * [E]		
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO _{2e} Projected Actual Emissions	= 126,707	tpy CO _{2e}	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead Projected Actual Emissions	= 5.3E-04	tpy	= [D] * [AD] / [E] / 2000
[AF]	SO ₂ maximum hourly	= 0.5	lb/hr	= [C] * [F]
[AG]	NO _x maximum hourly	= 7.6	lb/hr	= [C] * [G]
[AH]	PM maximum hourly	= 1.9	lb/hr	= [C] * [H] / [E]
[AI]	PM ₁₀ maximum hourly	= 1.9	lb/hr	= [C] * [I] / [E]
[AJ]	PM _{2.5} maximum hourly	= 1.9	lb/hr	= [C] * [J] / [E]
[AK]	CO maximum hourly	= 20.7	lb/hr	= [C] * [K] / [E]
[AL]	VOC maximum hourly	= 1.4	lb/hr	= [C] * [L] / [E]
[AM]	Lead maximum hourly	= 1.2E-04	lb/hr	= [C] * [AD] / [E]

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 210 H201 Heater Capable of Accommodating Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 210 H201 Heater Current Firing Rate Limit	= 242.00	MMBtu/hr	
[B]	Unit 210 H201 Heater Maximum Monthly Firing Rate	= 167,474	MMBtu/month	2010 and 2011 period
[C]	Unit 210 H201 Heater Maximum Monthly Firing Rate	= 225.10	MMBtu/hr	2010 and 2011 period
[D]	Annual Firing Rate Projected from Maximum Monthly Rate	= 2,009,693	MMBtu/yr	= [B] * 12
[E]	Higher heating value of fuel gas	= 1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0019	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.030	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ PTE	= 1.9	tpy	= [D] * [F] / 2000
[N]	NO _x PTE	= 30.1	tpy	= [D] * [G] / 2000
[O]	PM PTE	= 7.4	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ PTE	= 7.4	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} PTE	= 7.4	tpy	= [D] * [J] / [E] / 2000
[R]	CO PTE	= 81.9	tpy	= [D] * [K] / [F] / 2000
[S]	VOC PTE	= 5.4	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= 52.87	kg/MMBtu	= [T] * [W] / 1,000,000 * [E]
[Y]	Adjusted CH ₄ EF	= 0.001	kg/MMBtu	= [U] * [W] / 1,000,000 * [E]
[Z]	Adjusted N ₂ O EF	= 0.0001	kg/MMBtu	= [V] * [W] / 1,000,000 * [E]
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO ₂ e Projected Actual Emissions	= 117,238	tpy CO ₂ e	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead PTE	= 4.9E-04	tpy	= [D] * [AD] / [E] / 2000

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 866 12H1 Heater Projected Actual Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 866 12H1 Heater Current Firing Rate Limit	= 43.00	MMBtu/hr	
[B]	Unit 866 12H1 Heater Future Annual Average Firing Rate	= 52.10	MMBtu/hr	
[C]	Unit 866 12H1 Heater Future Hourly Maximum Firing Rate	= 61.20	MMBtu/hr	
[D]	Projected Maximum Annual Firing Rate	= 456,000	MMBtu/yr	= [B] * 8760 (Rounded to nearest thousand MMBtu)
[E]	Higher heating value of fuel gas	= 1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	= 0.0010	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	= 0.113	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	= 7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	= 7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	= 84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	= 5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ Projected Actual Emissions	= 0.2	tpy	= [D] * [F] / 2000
[N]	NO _x Projected Actual Emissions	= 25.8	tpy	= [D] * [G] / 2000
[O]	PM Projected Actual Emissions	= 1.7	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ Projected Actual Emissions	= 1.7	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} Projected Actual Emissions	= 1.7	tpy	= [D] * [J] / [E] / 2000
[R]	CO Projected Actual Emissions	= 18.6	tpy	= [D] * [K] / [E] / 2000
[S]	VOC Projected Actual Emissions	= 1.2	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	= 53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	= 0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	= 0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	= 0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	= [T] * [W] / 1,000,000 * [E]		
[Y]	Adjusted CH ₄ EF	= [U] * [W] / 1,000,000 * [E]		
[Z]	Adjusted N ₂ O EF	= [V] * [W] / 1,000,000 * [E]		
[AA]	CH ₄ Global Warming Potential	= 21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	= 310		40 CFR 98 Table A-1
[AC]	CO _{2e} Projected Actual Emissions	= 26,601	tpy CO _{2e}	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	= 0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead Projected Actual Emissions	= 1.1E-04	tpy	= [D] * [AD] / [E] / 2000
[AF]	SO ₂ maximum hourly	= 0.1	lb/hr	= [C] * [F]
[AG]	NO _x maximum hourly	= 6.9	lb/hr	= [C] * [G]
[AH]	PM maximum hourly	= 0.5	lb/hr	= [C] * [H] / [E]
[AI]	PM ₁₀ maximum hourly	= 0.5	lb/hr	= [C] * [I] / [E]
[AJ]	PM _{2.5} maximum hourly	= 0.5	lb/hr	= [C] * [J] / [E]
[AK]	CO maximum hourly	= 5.0	lb/hr	= [C] * [K] / [E]
[AL]	VOC maximum hourly	= 0.3	lb/hr	= [C] * [L] / [E]
[AM]	Lead maximum hourly	= 3.0E-05	lb/hr	= [C] * [AD] / [E]

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 866 12H1 Heater Capable of Accommodating Emissions Analysis

ID	Parameter		Value	Units	Source / Basis
[A]	Unit 866 12H1 Heater Current Firing Rate Limit	=	43.00	MMBtu/hr	
[B]	Unit 866 12H1 Heater Maximum Monthly Firing Rate	=	17,754	MMBtu/month	2010 and 2011 period
[C]	Unit 866 12H1 Heater Maximum Monthly Firing Rate	=	23.86	MMBtu/hr	2010 and 2011 period
[D]	Annual Firing Rate Projected from Maximum Monthly Rate	=	213,047	MMBtu/yr	= [B] * 12
[E]	Higher heating value of fuel gas	=	1,030.9	Btu/scf	Average of 2010 and 2011 HHV of fuel gas
[F]	SO ₂ EF	=	0.0010	lb/MMBtu	Based on 2011 SO ₂ emissions from Emission Inventory
[G]	NO _x EF	=	0.113	lb/MMBtu	NO _x RACT Limits
[H]	PM EF	=	7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[I]	PM ₁₀ EF	=	7.6	lb/MMscf	AP-42; 7/98; Table 1.4-2
[J]	PM _{2.5} EF	=	7.6	lb/MMscf	Assumed to be the same as PM ₁₀ emission factor
[K]	CO EF	=	84	lb/MMscf	AP-42; 7/98; Table 1.4-1
[L]	VOC EF	=	5.5	lb/MMscf	AP-42; 7/98; Table 1.4-2
[M]	SO ₂ PTE	=	0.1	tpy	= [D] * [F] / 2000
[N]	NO _x PTE	=	12.0	tpy	= [D] * [G] / 2000
[O]	PM PTE	=	0.8	tpy	= [D] * [H] / [E] / 2000
[P]	PM ₁₀ PTE	=	0.8	tpy	= [D] * [I] / [E] / 2000
[Q]	PM _{2.5} PTE	=	0.8	tpy	= [D] * [J] / [E] / 2000
[R]	CO PTE	=	8.7	tpy	= [D] * [K] / [F] / 2000
[S]	VOC PTE	=	0.6	tpy	= [D] * [L] / [E] / 2000
[T]	CO ₂ EF	=	53.02	kg/MMBtu	40 CFR 98 Table C-1
[U]	CH ₄ EF	=	0.001	kg/MMBtu	40 CFR 98 Table C-2
[V]	N ₂ O EF	=	0.0001	kg/MMBtu	40 CFR 98 Table C-2
[W]	Default HHV	=	0.001028	MMBtu/scf	40 CFR 98 Table C-1
[X]	Adjusted CO ₂ EF	=	52.87	kg/MMBtu	= [T] * [W] / 1,000,000 * [E]
[Y]	Adjusted CH ₄ EF	=	0.001	kg/MMBtu	= [U] * [W] / 1,000,000 * [E]
[Z]	Adjusted N ₂ O EF	=	0.0001	kg/MMBtu	= [V] * [W] / 1,000,000 * [E]
[AA]	CH ₄ Global Warming Potential	=	21		40 CFR 98 Table A-1
[AB]	N ₂ O Global Warming Potential	=	310		40 CFR 98 Table A-1
[AC]	CO _{2e} Projected Actual Emissions	=	12,428	tpy CO _{2e}	= (([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB])) / 1,000 * 1.102311311
[AD]	Lead EF	=	0.0005	lb/MMscf	AP-42; 7/98; Table 1.4-2
[AE]	Lead PTE	=	5.2E-05	tpy	= [D] * [AD] / [E] / 2000

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 868 8H101 Heater Projected Actual Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 868 8H101 Heater Current Firing Rate Limit	=	49.50	MMBtu/hr
[B]	Unit 868 8H101 Heater Future Annual Average Firing Rate	=	54.75	MMBtu/hr
[C]	Unit 868 8H101 Heater Future Hourly Maximum Firing Rate	=	60.00	MMBtu/hr
[D]	Projected Maximum Annual Firing Rate	=	480,000	MMBtu/yr
[E]	Higher heating value of fuel gas	=	1,067.0	Btu/scf
[F]	SO ₂ EF	=	0.0028	lb/MMBtu
[G]	NO _x EF	=	0.113	lb/MMBtu
[H]	PM EF	=	7.6	lb/MMscf
[I]	PM ₁₀ EF	=	7.6	lb/MMscf
[J]	PM _{2.5} EF	=	7.6	lb/MMscf
[K]	CO EF	=	84	lb/MMscf
[L]	VOC EF	=	5.5	lb/MMscf
[M]	SO ₂ Projected Actual Emissions	=	0.7	tpy
[N]	NO _x Projected Actual Emissions	=	27.1	tpy
[O]	PM Projected Actual Emissions	=	1.7	tpy
[P]	PM ₁₀ Projected Actual Emissions	=	1.7	tpy
[Q]	PM _{2.5} Projected Actual Emissions	=	1.7	tpy
[R]	CO Projected Actual Emissions	=	18.9	tpy
[S]	VOC Projected Actual Emissions	=	1.2	tpy
[T]	CO ₂ EF	=	53.02	kg/MMBtu
[U]	CH ₄ EF	=	0.001	kg/MMBtu
[V]	N ₂ O EF	=	0.0001	kg/MMBtu
[W]	Default HHV	=	0.001028	MMBtu/scf
[X]	Adjusted CO ₂ EF	=	51.08	kg/MMBtu
[Y]	Adjusted CH ₄ EF	=	0.001	kg/MMBtu
[Z]	Adjusted N ₂ O EF	=	0.0001	kg/MMBtu
[AA]	CH ₄ Global Warming Potential	=	21	
[AB]	N ₂ O Global Warming Potential	=	310	
[AC]	CO ₂ e Projected Actual Emissions	=	27,054	tpy CO ₂ e
[AD]	Lead EF	=	0.0005	lb/MMscf
[AE]	Lead Projected Actual Emissions	=	1.1E-04	tpy
[AF]	SO ₂ maximum hourly	=	0.2	lb/hr
[AG]	NO _x maximum hourly	=	6.8	lb/hr
[AH]	PM maximum hourly	=	0.4	lb/hr
[AI]	PM ₁₀ maximum hourly	=	0.4	lb/hr
[AJ]	PM _{2.5} maximum hourly	=	0.4	lb/hr
[AK]	CO maximum hourly	=	4.7	lb/hr
[AL]	VOC maximum hourly	=	0.3	lb/hr
[AM]	Lead maximum hourly	=	2.8E-05	lb/hr

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 868 8H101 Heater Capable of Accommodating Emissions Analysis

ID	Parameter	Value	Units	Source / Basis
[A]	Unit 868 8H101 Heater Current Firing Rate Limit	=	49.50	MMBtu/hr
[B]	Unit 868 8H101 Heater Maximum Monthly Firing Rate	=	35,848	MMBtu/month
[C]	Unit 868 8H101 Heater Maximum Monthly Firing Rate	=	48.18	MMBtu/hr
[D]	Annual Firing Rate Projected from Maximum Monthly Rate	=	430,173	MMBtu/yr
[E]	Higher heating value of fuel gas	=	1,067.0	Btu/scf
[F]	SO ₂ EF	=	0.0028	lb/MMBtu
[G]	NO _x EF	=	0.113	lb/MMBtu
[H]	PM EF	=	7.6	lb/MMscf
[I]	PM ₁₀ EF	=	7.6	lb/MMscf
[J]	PM _{2.5} EF	=	7.6	lb/MMscf
[K]	CO EF	=	84	lb/MMscf
[L]	VOC EF	=	5.5	lb/MMscf
[M]	SO ₂ PTE	=	0.6	tpy
[N]	NO _x PTE	=	24.3	tpy
[O]	PM PTE	=	1.5	tpy
[P]	PM ₁₀ PTE	=	1.5	tpy
[Q]	PM _{2.5} PTE	=	1.5	tpy
[R]	CO PTE	=	16.9	tpy
[S]	VOC PTE	=	1.1	tpy
[T]	CO ₂ EF	=	53.02	kg/MMBtu
[U]	CH ₄ EF	=	0.001	kg/MMBtu
[V]	N ₂ O EF	=	0.0001	kg/MMBtu
[W]	Default HHV	=	0.001028	MMBtu/scf
[X]	Adjusted CO ₂ EF	=	51.08	kg/MMBtu
[Y]	Adjusted CH ₄ EF	=	0.001	kg/MMBtu
[Z]	Adjusted N ₂ O EF	=	0.0001	kg/MMBtu
[AA]	CH ₄ Global Warming Potential	=	21	
[AB]	N ₂ O Global Warming Potential	=	310	
[AC]	CO ₂ e Projected Actual Emissions	=	24,246	tpy CO ₂ e
[AD]	Lead EF	=	0.0005	lb/MMscf
[AE]	Lead PTE	=	1.0E-04	tpy
				$= ([D] * [X]) + ([D] * [Y] * [AA]) + ([D] * [Z] * [AB]) / 1,000 * 1.102311311$
				AP-42; 7/98; Table 1.4-2
				$= [D] * [AD] / [E] / 2000$

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Fired Duties

	FIRED DUTY Unit 137 F-1	FIRED DUTY Unit 231-B101	FIRED DUTY Unit 865-11H1	FIRED DUTY Unit 865-11H2	FIRED DUTY Unit 210-H101	FIRED DUTY Unit 210-H201	FIRED DUTY Unit 866-12H1	FIRED DUTY Unit 868-8H101	Total FIRED DUTY
	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU
Jan-10	287,352	42,375	47,785	34,153	124,270	167,474	17,754	35,848	757,011
Feb-10	260,343	35,110	45,973	31,864	112,764	145,603	18,345	32,741	682,743
Mar-10	275,494	46,464	25,650	19,329	114,528	148,902	11,094	31,858	673,320
Apr-10	260,290	43,228	42,885	29,961	116,996	135,703	12,919	30,229	672,210
May-10	261,978	43,178	47,847	29,954	112,894	139,001	11,979	36,307	683,139
Jun-10	253,355	34,825	42,568	26,710	109,908	133,453	11,953	32,720	645,492
Jul-10	260,892	34,167	45,644	27,578	113,417	132,743	13,376	23,973	651,789
Aug-10	266,443	43,897	43,338	32,173	116,118	161,623	15,245	35,846	714,683
Sep-10	245,912	42,980	38,133	29,818	109,541	141,423	13,665	19,965	641,438
Oct-10	245,453	37,453	44,274	33,225	119,057	137,769	21,000	26,517	664,750
Nov-10	212,200	35,040	39,540	33,058	118,019	143,317	2,011	35,237	618,422
Dec-10	216,312	38,046	33,851	32,372	120,112	133,952	10,247	34,539	619,431
Jan-11	265,811	45,834	40,264	31,414	117,352	131,607	12,599	35,770	680,650
Feb-11	82,835	7,762	35,740	29,138	111,444	119,956	12,047	32,771	431,692
Mar-11	119,780	4,080	12,005	9,889	128,112	116,369	15,316	27,437	432,987
Apr-11	172,577	28,545	1,545	7,209	122,999	104,737	4,607	22,103	464,323
May-11	275,590	47,328	43,406	32,653	116,662	122,289	10,671	25,041	673,641
Jun-11	266,564	37,365	38,421	30,314	115,660	115,614	8,960	25,144	638,042
Jul-11	299,918	42,374	38,816	29,391	119,003	111,253	11,306	27,107	679,167
Aug-11	261,059	42,641	40,901	30,388	123,501	88,518	13,817	30,067	630,892
Sep-11	282,678	41,780	39,866	31,807	108,280	122,327	16,926	21,729	665,393
Oct-11	303,484	51,500	39,063	32,018	117,347	149,238	16,975	26,829	736,452
Nov-11	282,035	47,964	48,434	32,648	117,078	143,349	19,973	12,284	703,765
Dec-11	299,582	47,970	51,031	33,368	107,605	152,579	20,627	10,024	722,787

	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU	MMBTU
2010-2011	287,352	42,375	47,785	34,153	124,270	167,474	17,754	35,848
Month	Jan-10	Jan-10	Jan-10	Jan-10	Jan-10	Jan-10	Jan-10	Jan-10
Hours per month	744	744	744	744	744	744	744	744

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Monthly Emissions

	PM (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-F1101	210-H201	866-12H1	868-8H101	Total
Jan-10	1.03	0.15	0.17	0.12	0.44	0.60	0.06	0.12	2.70
Feb-10	0.93	0.13	0.16	0.11	0.40	0.52	0.07	0.11	2.44
Mar-10	0.98	0.17	0.09	0.07	0.41	0.53	0.04	0.11	2.40
Apr-10	0.93	0.15	0.15	0.11	0.42	0.49	0.05	0.10	2.40
May-10	0.94	0.15	0.17	0.11	0.40	0.50	0.04	0.12	2.44
Jun-10	0.91	0.12	0.15	0.10	0.39	0.48	0.04	0.11	2.30
Jul-10	0.93	0.12	0.16	0.10	0.41	0.48	0.05	0.08	2.33
Aug-10	0.95	0.16	0.16	0.12	0.42	0.58	0.05	0.12	2.55
Sep-10	0.88	0.15	0.14	0.11	0.39	0.51	0.05	0.07	2.29
Oct-10	0.88	0.13	0.16	0.12	0.43	0.49	0.08	0.09	2.37
Nov-10	0.76	0.13	0.14	0.12	0.42	0.51	0.01	0.12	2.21
Dec-10	0.77	0.14	0.12	0.12	0.43	0.48	0.04	0.12	2.21
Jan-11	0.97	0.17	0.15	0.12	0.45	0.50	0.05	0.13	2.54
Feb-11	0.30	0.03	0.14	0.11	0.42	0.46	0.05	0.12	1.63
Mar-11	0.44	0.02	0.05	0.04	0.49	0.44	0.06	0.10	1.63
Apr-11	0.63	0.11	0.01	0.03	0.47	0.40	0.02	0.08	1.73
May-11	1.01	0.18	0.16	0.12	0.44	0.46	0.04	0.09	2.51
Jun-11	0.97	0.14	0.15	0.12	0.44	0.44	0.03	0.09	2.38
Jul-11	1.10	0.16	0.15	0.11	0.45	0.42	0.04	0.10	2.53
Aug-11	0.95	0.16	0.16	0.12	0.47	0.34	0.05	0.11	2.35
Sep-11	1.03	0.15	0.15	0.12	0.41	0.46	0.06	0.08	2.48
Oct-11	1.11	0.19	0.15	0.12	0.45	0.57	0.06	0.10	2.75
Nov-11	1.03	0.18	0.18	0.12	0.44	0.54	0.08	0.05	2.63
Dec-11	1.09	0.18	0.19	0.13	0.41	0.58	0.08	0.04	2.70

	PM (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-F1101	210-H201	866-12H1	868-8H101	Total
2010	10.89	1.70	1.78	1.29	4.97	6.16	0.57	1.28	28.64
2011	10.64	1.65	1.63	1.25	5.34	5.62	0.62	1.11	27.86
2010-2011 average	10.76	1.68	1.71	1.27	5.15	5.89	0.60	1.19	28.25

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Monthly Emissions

	CO (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
Jan-10	11.35	1.67	1.89	1.35	4.92	6.62	0.70	1.35	29.86
Feb-10	10.29	1.39	1.82	1.26	4.46	5.76	0.73	1.23	26.93
Mar-10	10.89	1.84	1.01	0.76	4.53	5.89	0.44	1.20	26.56
Apr-10	10.28	1.71	1.70	1.19	4.63	5.37	0.51	1.14	26.52
May-10	10.35	1.71	1.89	1.18	4.47	5.50	0.47	1.37	26.94
Jun-10	10.01	1.38	1.68	1.06	4.35	5.28	0.47	1.23	25.46
Jul-10	10.31	1.35	1.81	1.09	4.49	5.25	0.53	0.90	25.72
Aug-10	10.53	1.73	1.71	1.27	4.59	6.39	0.60	1.35	28.19
Sep-10	9.72	1.70	1.51	1.18	4.33	5.59	0.54	0.75	25.32
Oct-10	9.70	1.48	1.75	1.31	4.71	5.45	0.83	1.00	26.23
Nov-10	8.38	1.38	1.56	1.31	4.67	5.67	0.08	1.33	24.38
Dec-10	8.55	1.50	1.34	1.28	4.75	5.30	0.41	1.30	24.42
Jan-11	10.73	1.87	1.69	1.32	4.93	5.53	0.53	1.48	28.08
Feb-11	3.35	0.32	1.50	1.22	4.68	5.04	0.51	1.35	17.96
Mar-11	4.84	0.17	0.50	0.42	5.38	4.89	0.64	1.13	17.97
Apr-11	6.97	1.17	0.06	0.30	5.17	4.40	0.19	0.91	19.17
May-11	11.13	1.94	1.82	1.37	4.90	5.14	0.45	1.03	27.78
Jun-11	10.76	1.53	1.61	1.27	4.86	4.86	0.38	1.04	26.31
Jul-11	12.11	1.73	1.63	1.23	5.00	4.67	0.47	1.12	27.97
Aug-11	10.54	1.74	1.72	1.28	5.19	3.72	0.58	1.24	26.01
Sep-11	11.41	1.71	1.67	1.34	4.55	5.14	0.71	0.90	27.43
Oct-11	12.26	2.11	1.64	1.34	4.93	6.27	0.71	1.11	30.36
Nov-11	11.39	1.96	2.03	1.37	4.92	6.02	0.84	0.51	29.04
Dec-11	12.10	1.96	2.14	1.40	4.52	6.41	0.87	0.41	29.81

	CO (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
2010	120.36	18.83	19.68	14.25	54.89	68.07	6.31	14.14	316.52
2011	117.59	18.20	18.04	13.87	59.01	62.07	6.88	12.23	307.89
2010-2011 average	118.97	18.52	18.86	14.06	56.95	65.07	6.60	13.18	312.21

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Monthly Emissions

	VOC (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
Jan-10	0.74	0.11	0.12	0.09	0.32	0.43	0.05	0.09	1.96
Feb-10	0.67	0.09	0.12	0.08	0.29	0.38	0.05	0.08	1.76
Mar-10	0.71	0.12	0.07	0.05	0.30	0.39	0.03	0.08	1.74
Apr-10	0.67	0.11	0.11	0.08	0.30	0.35	0.03	0.07	1.74
May-10	0.68	0.11	0.12	0.08	0.29	0.36	0.03	0.09	1.76
Jun-10	0.66	0.09	0.11	0.07	0.28	0.35	0.03	0.08	1.67
Jul-10	0.67	0.09	0.12	0.07	0.29	0.34	0.03	0.06	1.68
Aug-10	0.69	0.11	0.11	0.08	0.30	0.42	0.04	0.09	1.85
Sep-10	0.64	0.11	0.10	0.08	0.28	0.37	0.04	0.05	1.66
Oct-10	0.64	0.10	0.11	0.09	0.31	0.36	0.05	0.07	1.72
Nov-10	0.55	0.09	0.10	0.09	0.31	0.37	0.01	0.09	1.60
Dec-10	0.56	0.10	0.09	0.08	0.31	0.35	0.03	0.09	1.60
Jan-11	0.70	0.12	0.11	0.09	0.32	0.36	0.03	0.10	1.84
Feb-11	0.22	0.02	0.10	0.08	0.31	0.33	0.03	0.09	1.18
Mar-11	0.32	0.01	0.03	0.03	0.35	0.32	0.04	0.07	1.18
Apr-11	0.46	0.08	0.00	0.02	0.34	0.29	0.01	0.06	1.26
May-11	0.73	0.13	0.12	0.09	0.32	0.34	0.03	0.07	1.82
Jun-11	0.70	0.10	0.11	0.08	0.32	0.32	0.02	0.07	1.72
Jul-11	0.79	0.11	0.11	0.08	0.33	0.31	0.03	0.07	1.83
Aug-11	0.69	0.11	0.11	0.08	0.34	0.24	0.04	0.08	1.70
Sep-11	0.75	0.11	0.11	0.09	0.30	0.34	0.05	0.06	1.80
Oct-11	0.80	0.14	0.11	0.09	0.32	0.41	0.05	0.07	1.99
Nov-11	0.75	0.13	0.13	0.09	0.32	0.39	0.05	0.03	1.90
Dec-11	0.79	0.13	0.14	0.09	0.30	0.42	0.06	0.03	1.95

	VOC (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
2010	7.88	1.23	1.29	0.93	3.59	4.46	0.41	0.93	20.72
2011	7.70	1.19	1.18	0.91	3.86	4.06	0.45	0.80	20.16
2010-2011 average	7.79	1.21	1.23	0.92	3.73	4.26	0.43	0.86	20.44

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Monthly Emissions

	NOx Adjusted (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
Jan-10	19.77	2.59	2.70	1.92	5.53	2.01	1.00	2.03	37.56
Feb-10	17.91	2.14	2.60	1.79	5.02	1.75	1.04	1.85	34.11
Mar-10	18.96	2.84	1.45	1.09	5.10	1.79	0.63	1.80	33.64
Apr-10	17.91	2.64	2.42	1.69	5.21	1.63	0.73	1.71	33.94
May-10	18.03	2.64	2.71	1.69	5.02	1.67	0.68	2.05	34.48
Jun-10	17.43	2.13	2.41	1.50	4.89	1.60	0.68	1.85	32.49
Jul-10	17.95	2.09	2.58	1.55	5.05	1.59	0.76	1.36	32.92
Aug-10	18.33	2.68	2.45	1.81	5.17	1.94	0.86	2.03	35.27
Sep-10	16.92	2.62	2.16	1.68	4.87	1.70	0.77	1.13	31.85
Oct-10	16.89	2.29	2.50	1.87	5.30	1.65	1.19	1.50	33.19
Nov-10	14.60	2.14	2.24	1.86	5.25	1.72	0.11	1.99	29.92
Dec-10	14.88	2.32	1.91	1.82	5.34	1.61	0.58	1.95	30.43
Jan-11	16.41	2.80	2.27	1.78	5.23	1.73	0.71	2.02	32.94
Feb-11	5.11	0.47	2.01	1.65	4.96	1.57	0.68	1.85	18.32
Mar-11	7.40	0.25	0.68	0.56	5.70	1.53	0.86	1.55	18.52
Apr-11	10.66	1.74	0.09	0.41	5.48	1.37	0.26	1.25	21.25
May-11	17.02	2.89	2.45	1.85	5.19	1.61	0.60	1.41	33.02
Jun-11	16.46	2.28	2.17	1.71	5.15	1.52	0.50	1.42	31.21
Jul-11	18.52	2.59	2.19	1.66	5.30	1.46	0.64	1.53	33.88
Aug-11	16.12	2.61	2.31	1.72	5.50	1.16	0.78	1.70	31.88
Sep-11	17.45	2.55	2.25	1.80	4.82	1.61	0.95	1.23	32.66
Oct-11	18.74	3.15	2.20	1.81	5.22	1.96	0.96	1.51	35.55
Nov-11	17.41	2.93	2.73	1.85	5.21	1.88	1.12	0.69	33.83
Dec-11	18.50	2.93	2.88	1.89	4.79	2.00	1.16	0.57	34.71

	NOx Adjusted (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
2010	209.60	29.10	28.13	20.29	61.75	20.65	9.03	21.25	399.80
2011	179.80	27.20	24.21	18.68	62.56	19.40	9.22	16.72	357.79
2010-2011 average	194.70	28.15	26.17	19.49	62.15	20.03	9.13	18.98	378.80

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Monthly Emissions

	SO ₂ (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
Jan-10	0.31	0.06	0.01	0.01	0.03	0.05	0.01	0.03	0.51
Feb-10	0.32	0.03	0.02	0.01	0.04	0.05	0.01	0.03	0.50
Mar-10	0.21	0.01	0.02	0.01	0.57	0.59	0.08	0.03	1.52
Apr-10	0.15	0.02	0.02	0.02	0.07	0.08	0.01	0.02	0.39
May-10	0.39	0.02	0.04	0.03	0.10	0.12	0.01	0.03	0.74
Jun-10	0.72	0.03	0.04	0.02	0.09	0.11	0.01	0.03	1.04
Jul-10	0.48	0.02	0.03	0.02	0.06	0.07	0.01	0.03	0.71
Aug-10	0.62	0.03	0.10	0.07	0.26	0.36	0.03	0.04	1.51
Sep-10	0.19	0.03	0.08	0.06	0.23	0.29	0.03	0.02	0.94
Oct-10	0.18	0.01	0.05	0.04	0.13	0.16	0.02	0.02	0.63
Nov-10	0.15	0.01	0.03	0.02	0.08	0.09	0.00	0.07	0.45
Dec-10	0.15	0.01	0.02	0.02	0.08	0.09	0.01	0.04	0.43
Jan-11	0.00	0.00	0.04	0.03	0.12	0.14	0.01	0.03	0.38
Feb-11	0.01	0.00	0.06	0.05	0.19	0.21	0.02	0.04	0.58
Mar-11	0.04	0.00	0.03	0.02	0.28	0.25	0.04	0.04	0.70
Apr-11	0.50	0.00	0.00	0.01	0.91	0.74	0.01	0.03	2.19
May-11	1.65	0.07	0.02	0.01	0.05	0.05	0.00	0.04	1.90
Jun-11	0.37	0.05	0.00	0.00	0.00	0.00	0.00	0.07	0.49
Jul-11	0.42	0.06	0.00	0.00	0.00	0.00	0.00	0.06	0.53
Aug-11	0.37	0.06	0.00	0.00	0.00	0.00	0.00	0.04	0.47
Sep-11	0.42	0.06	0.00	0.00	0.00	0.00	0.00	0.03	0.50
Oct-11	0.44	0.07	0.00	0.00	0.00	0.00	0.00	0.02	0.54
Nov-11	0.43	0.07	0.00	0.00	0.00	0.00	0.00	0.01	0.51
Dec-11	0.45	0.07	0.00	0.00	0.00	0.00	0.00	0.01	0.53

	SO ₂ (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
2010	3.88	0.28	0.45	0.33	1.75	2.06	0.23	0.40	9.38
2011	5.10	0.53	0.15	0.13	1.54	1.38	0.08	0.41	9.33
2010-2011 average	4.49	0.41	0.30	0.23	1.65	1.72	0.16	0.41	9.36

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Monthly Emissions

	Lead (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
Jan-10	6.8E-05	1.0E-05	1.1E-05	8.0E-06	2.9E-05	3.9E-05	4.2E-06	8.0E-06	1.8E-04
Feb-10	6.1E-05	8.3E-06	1.1E-05	7.5E-06	2.7E-05	3.4E-05	4.3E-06	7.3E-06	1.6E-04
Mar-10	6.5E-05	1.1E-05	6.0E-06	4.6E-06	2.7E-05	3.5E-05	2.6E-06	7.1E-06	1.6E-04
Apr-10	6.1E-05	1.0E-05	1.0E-05	7.1E-06	2.8E-05	3.2E-05	3.0E-06	6.8E-06	1.6E-04
May-10	6.2E-05	1.0E-05	1.1E-05	7.1E-06	2.7E-05	3.3E-05	2.8E-06	8.1E-06	1.6E-04
Jun-10	6.0E-05	8.2E-06	1.0E-05	6.3E-06	2.6E-05	3.1E-05	2.8E-06	7.3E-06	1.5E-04
Jul-10	6.1E-05	8.0E-06	1.1E-05	6.5E-06	2.7E-05	3.1E-05	3.1E-06	5.4E-06	1.5E-04
Aug-10	6.3E-05	1.0E-05	1.0E-05	7.6E-06	2.7E-05	3.8E-05	3.6E-06	8.0E-06	1.7E-04
Sep-10	5.8E-05	1.0E-05	9.0E-06	7.0E-06	2.6E-05	3.3E-05	3.2E-06	4.5E-06	1.5E-04
Oct-10	5.8E-05	8.8E-06	1.0E-05	7.8E-06	2.8E-05	3.2E-05	4.9E-06	5.9E-06	1.6E-04
Nov-10	5.0E-05	8.2E-06	9.3E-06	7.8E-06	2.8E-05	3.4E-05	4.7E-07	7.9E-06	1.5E-04
Dec-10	5.1E-05	8.9E-06	8.0E-06	7.6E-06	2.8E-05	3.2E-05	2.4E-06	7.7E-06	1.5E-04
Jan-11	6.4E-05	1.1E-05	1.0E-05	7.9E-06	2.9E-05	3.3E-05	3.1E-06	8.8E-06	1.7E-04
Feb-11	2.0E-05	1.9E-06	8.9E-06	7.3E-06	2.8E-05	3.0E-05	3.0E-06	8.1E-06	1.1E-04
Mar-11	2.9E-05	9.9E-07	3.0E-06	2.5E-06	3.2E-05	2.9E-05	3.8E-06	6.7E-06	1.1E-04
Apr-11	4.1E-05	6.9E-06	3.9E-07	1.8E-06	3.1E-05	2.6E-05	1.2E-06	5.4E-06	1.1E-04
May-11	6.6E-05	1.2E-05	1.1E-05	8.2E-06	2.9E-05	3.1E-05	2.7E-06	6.2E-06	1.7E-04
Jun-11	6.4E-05	9.1E-06	9.6E-06	7.6E-06	2.9E-05	2.9E-05	2.2E-06	6.2E-06	1.6E-04
Jul-11	7.2E-05	1.0E-05	9.7E-06	7.3E-06	3.0E-05	2.8E-05	2.8E-06	6.7E-06	1.7E-04
Aug-11	6.3E-05	1.0E-05	1.0E-05	7.6E-06	3.1E-05	2.2E-05	3.5E-06	7.4E-06	1.5E-04
Sep-11	6.8E-05	1.0E-05	1.0E-05	8.0E-06	2.7E-05	3.1E-05	4.2E-06	5.3E-06	1.6E-04
Oct-11	7.3E-05	1.3E-05	9.8E-06	8.0E-06	2.9E-05	3.7E-05	4.2E-06	6.6E-06	1.8E-04
Nov-11	6.8E-05	1.2E-05	1.2E-05	8.2E-06	2.9E-05	3.6E-05	5.0E-06	3.0E-06	1.7E-04
Dec-11	7.2E-05	1.2E-05	1.3E-05	8.3E-06	2.7E-05	3.8E-05	5.2E-06	2.5E-06	1.8E-04
	Lead (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H101	210-H201	866-12H1	868-8H101	Total
2010	7.2E-04	1.1E-04	1.2E-04	8.5E-05	3.3E-04	4.1E-04	3.8E-05	8.4E-05	1.9E-03
2011	7.0E-04	1.1E-04	1.1E-04	8.3E-05	3.5E-04	3.7E-04	4.1E-05	7.3E-05	1.8E-03
2010-2011 average	7.1E-04	1.1E-04	1.1E-04	8.4E-05	3.4E-04	3.9E-04	3.9E-05	7.8E-05	1.9E-03

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Monthly Emissions

	CO ₂ e (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H1101	210-H201	866-12H1	868-8H101	Total
Jan-10	16,258	2,397	2,706	1,934	7,038	9,485	1,006	1,931	42755.90
Feb-10	14,730	1,986	2,604	1,805	6,387	8,247	1,039	1,764	38560.23
Mar-10	15,587	2,628	1,453	1,095	6,487	8,433	628	1,716	38027.29
Apr-10	14,727	2,445	2,429	1,697	6,626	7,686	732	1,628	37970.09
May-10	14,823	2,442	2,710	1,697	6,394	7,873	678	1,956	38572.12
Jun-10	14,335	1,970	2,411	1,513	6,225	7,558	677	1,762	36450.94
Jul-10	14,761	1,933	2,585	1,562	6,424	7,518	758	1,291	36831.42
Aug-10	15,075	2,483	2,455	1,822	6,577	9,154	863	1,931	40359.66
Sep-10	13,913	2,431	2,160	1,689	6,204	8,010	774	1,075	36256.50
Oct-10	13,888	2,119	2,508	1,882	6,743	7,803	1,189	1,428	37559.10
Nov-10	12,006	1,982	2,239	1,872	6,684	8,117	114	1,898	34913.20
Dec-10	12,239	2,152	1,917	1,833	6,803	7,587	580	1,860	34971.79
Jan-11	15,370	2,683	2,421	1,889	7,058	7,915	758	2,114	40208.39
Feb-11	4,790	454	2,149	1,752	6,702	7,214	724	1,937	25723.89
Mar-11	6,926	239	722	595	7,705	6,999	921	1,622	25727.50
Apr-11	9,979	1,671	93	434	7,397	6,299	277	1,306	27456.19
May-11	15,935	2,771	2,610	1,964	7,016	7,355	642	1,480	39772.92
Jun-11	15,413	2,188	2,311	1,823	6,956	6,953	539	1,486	37668.69
Jul-11	17,342	2,481	2,334	1,768	7,157	6,691	680	1,602	40054.64
Aug-11	15,095	2,496	2,460	1,828	7,427	5,324	831	1,777	37237.90
Sep-11	16,345	2,446	2,398	1,913	6,512	7,357	1,018	1,284	39272.74
Oct-11	17,548	3,015	2,349	1,926	7,057	8,975	1,021	1,586	43477.28
Nov-11	16,308	2,808	2,913	1,964	7,041	8,621	1,201	726	41581.90
Dec-11	17,323	2,808	3,069	2,007	6,471	9,176	1,241	592	42687.56

	CO ₂ e (TPY)								
	137 F-1	231-B101	865-11H1	865-11H2	210-H1101	210-H201	866-12H1	868-8H101	Total
2010	172,342	26,968	28,176	20,400	78,591	97,470	9,039	20,242	453,228
2011	168,373	26,062	25,830	19,861	84,501	88,878	9,853	17,512	440,870
2010-2011 average	170,357	26,515	27,003	20,131	81,546	93,174	9,446	18,877	447,049

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater Emission Factors

Period	137 F-1 HHV	231-B101 HHV	865-11H1 HHV	865-11H2 HHV	210-H101 HHV	210-H201 HHV	866-12H1 HHV	868-8H101 HHV
	BTU/SCF	BTU/SCF	BTU/SCF	BTU/SCF	BTU/SCF	BTU/SCF	BTU/SCF	BTU/SCF
2010	1,062.93	1,063.20	1,061.85	1,061.85	1,061.85	1,061.85	1,061.85	1,116.46
2011	1,040.08	1,027.21	999.98	999.98	999.98	999.98	999.98	1,017.56

Source	AP-42 Chapter 1.4 (lb/10 ⁶ scf) Gas						lb/MMBtu				
	PM 2009	PM 2010	PM 2011	CO	VOC	Lead	NO _x	NO _x Adjusted 2011	NO _x Adjusted 2010/2009	NO _x RACT	SO ₂
137 F-1	1.9	7.6	7.6	84	5.5	0.0005	140	0.123	0.138	0.123	0.0035
231-B101	1.9	7.6	7.6	84	5.5	0.0005	50	0.122	0.122	0.122	0.0024
865-11H1	1.9	7.6	7.6	84	5.5	0.0005	50	0.113	0.113	0.113	0.0007
865-11H2	1.9	7.6	7.6	84	5.5	0.0005	50	0.113	0.113	0.113	0.0008
210-H101	1.9	7.6	7.6	84	5.5	0.0005	140	0.089	0.089	0.089	0.0022
210-H201	1.9	7.6	7.6	84	5.5	0.0005	140	0.026	0.024	0.03	0.0019
866-12H1	1.9	7.6	7.6	84	5.5	0.0005	50	0.113	0.113	0.113	0.0010
868-H101	1.9	7.6	7.6	84	5.5	0.0005	50	0.113	0.113	0.113	0.0028

Source	40 CFR 98 Emission factors (kg/MMBtu)				kg/MMBtu				lb/MMBtu				
	CO ₂	CH ₄	N ₂ O	2010 Adjusted CO ₂ factor	2010 Adjusted CH ₄ factor	2010 Adjusted N ₂ O factor	2010 Adjusted CO _{2e} factor	2011 Adjusted CO ₂ factor	2011 Adjusted CH ₄ factor	2011 Adjusted N ₂ O factor	2011 Adjusted CO _{2e} factor	2010 Adjusted CO _{2e} factor	2011 Adjusted CO _{2e} factor
137 F-1	53.02	0.001	0.0001	51.3	0.001	0.0001	51.3	52.4	0.001	0.0001	52.5	113.2	115.6
231-B101	53.02	0.001	0.0001	51.3	0.001	0.0001	51.3	53.1	0.001	0.0001	53.1	113.1	117.1
865-11H1	53.02	0.001	0.0001	51.3	0.001	0.0001	51.4	54.5	0.001	0.0001	54.6	113.3	120.3
865-11H2	53.02	0.001	0.0001	51.3	0.001	0.0001	51.4	54.5	0.001	0.0001	54.6	113.3	120.3
210-H101	53.02	0.001	0.0001	51.3	0.001	0.0001	51.4	54.5	0.001	0.0001	54.6	113.3	120.3
210-H201	53.02	0.001	0.0001	51.3	0.001	0.0001	51.4	54.5	0.001	0.0001	54.6	113.3	120.3
866-12H1	53.02	0.001	0.0001	51.3	0.001	0.0001	51.4	54.5	0.001	0.0001	54.6	113.3	120.3
868-H101	53.02	0.001	0.0001	48.8	0.001	0.0001	48.9	53.6	0.001	0.0001	53.6	107.7	118.2

40 CFR 98 Defaults			
GWP	CO ₂	CH ₄	N ₂ O
	1	21	310
Default natural gas HHV (MMBtu/scf)	0.001028		

PES Refinery

Heater Firing Rate Increase Plan Approval

Target Heater SO₂ Emissions

	Unit 137 F-1	Unit 231-B101	Unit 865-11H1	Unit 865-11H2	Unit 210-H101	Unit 210-H201	Unit 866-12H1	Unit 868-8H101
	SO ₂ , pounds							
Jan-10	626.01	115.62	28.68	19.46	69.14	90.92	10.19	69.19
Feb-10	636.17	62.47	31.02	22.16	78.31	104.99	12.54	59.53
Mar-10	420.21	21.10	31.78	25.45	1145.24	1177.73	165.60	59.07
Apr-10	309.27	34.22	47.17	33.19	130.91	152.81	13.41	49.36
May-10	786.80	39.74	86.65	53.97	193.65	237.08	23.04	56.72
Jun-10	1436.32	51.43	70.43	44.39	183.89	221.00	19.97	61.95
Jul-10	952.26	44.54	50.86	33.40	125.88	144.94	15.35	61.34
Aug-10	1239.47	51.17	194.10	144.96	521.67	726.90	67.99	75.29
Sep-10	381.15	69.51	159.49	126.53	464.22	577.50	55.28	47.80
Oct-10	359.97	27.48	103.74	75.17	268.43	317.77	49.06	49.03
Nov-10	297.51	27.93	54.66	44.48	150.13	187.08	1.76	136.81
Dec-10	307.45	16.88	45.25	44.63	167.56	185.73	16.84	74.96
Jan-11	0.00	3.04	87.29	66.89	243.78	279.18	26.14	55.15
Feb-11	26.46	0.76	122.60	98.17	376.82	411.35	41.22	87.95
Mar-11	87.74	4.32	57.33	47.95	553.88	492.23	77.94	86.03
Apr-11	990.80	9.58	1.51	18.13	1810.99	1475.51	14.90	58.01
May-11	3298.77	130.77	34.10	28.75	101.72	102.15	9.68	89.65
Jun-11	738.45	106.14	0.00	0.00	0.00	0.00	0.00	134.74
Jul-11	834.96	119.66	0.00	0.00	0.00	0.00	0.00	110.56
Aug-11	735.02	121.07	0.00	0.00	0.00	0.00	0.00	79.93
Sep-11	830.84	122.49	0.00	0.00	0.00	0.00	0.00	50.81
Oct-11	884.34	148.64	0.00	0.00	0.00	0.00	0.00	47.85
Nov-11	858.10	147.03	0.00	0.00	0.00	0.00	0.00	12.84
Dec-11	909.03	147.29	0.00	0.00	0.00	0.00	0.00	12.08
2011 SO ₂ EF (lb/MMBtu)	0.00350	0.00238	0.00071	0.00079	0.00220	0.00187	0.00104	0.00279

PES Refinery

Heater Firing Rate Increase Plan Approval

Total Crude Charge

	GP - 137	PB - 210	Total	Days/month	Total	GP - 137	PB - 210
	MBbl/month	MBbl/month	MBbl/month		MBbl/day	MBbl/day	MBbl/day
Jan-10	5602	3987	9589	31	309.31	180.7	128.6
Feb-10	4930	3451	8382	28	299.35	176.1	123.3
Mar-10	5304	3700	9004	31	290.45	171.1	119.4
Apr-10	5530	3797	9327	30	310.89	184.3	126.6
May-10	5660	4114	9774	31	315.28	182.6	132.7
Jun-10	5313	4183	9496	30	316.54	177.1	139.4
Jul-10	5548	4116	9664	31	311.74	179.0	132.8
Aug-10	5502	4220	9722	31	313.63	177.5	136.1
Sep-10	5160	3839	9000	30	299.99	172.0	128.0
Oct-10	4664	3834	8498	31	274.14	150.5	123.7
Nov-10	3952	3880	7832	30	261.05	131.7	129.3
Dec-10	3989	3697	7687	31	247.96	128.7	119.3
Jan-11	5314	3750	9064	31	292.39	171.4	121.0
Feb-11	1658	3254	4912	28	175.45	59.2	116.2
Mar-11	3344	3290	6634	31	214.00	107.9	106.1
Apr-11	3525	3091	6616	30	220.52	117.5	103.0
May-11	5696	3596	9292	31	299.74	183.8	116.0
Jun-11	5418	3493	8911	30	297.04	180.6	116.4
Jul-11	5801	3681	9482	31	305.87	187.1	118.7
Aug-11	5134	3364	8498	31	274.13	165.6	108.5
Sep-11	5165	3401	8566	30	285.53	172.2	113.4
Oct-11	5812	3678	9489	31	306.11	187.5	118.6
Nov-11	5408	3503	8911	30	297.02	180.3	116.8
Dec-11	5699	3562	9261	31	298.74	183.8	114.9

Crude Increase Basis

Crude Unit	2010-11 Actual Rate (MBPD)	Capable Rate - January 2010 (MBPD)	Capable increase from baseline (%)	Future Projected Actual Rate (MBPD)	Expected increase from this plan approval (%)
GP-137	163.2	180.7	111%	200.0	123%
PB-210	121.2	128.6	106%	130.0	107%
TOTAL	284.4	309.3	109%	330.0	116%

Source	2010 ACTUAL EMISSIONS (TPY)					2011 ACTUAL EMISSIONS (TPY)					2010-11 Average ACTUAL EMISSIONS (TPY)				
	VOC	SOx	NOx	CO	PM	VOC	SOx	NOx	CO	PM	VOC	SOx	NOx	CO	PM
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
LDAR*	176.40	-	-	-	-	174.48	-	-	-	-	175.44	-	-	-	-
COOLING TOWERS*	50.18	-	-	-	32.76	50.18	-	-	-	30.82	50.18	-	-	-	31.79
FLARES*	36.20	0.22	17.51	95.50	-	31.78	0.13	15.47	84.00	-	33.99	0.17	16.49	89.75	-
SAMPLING SYSTEMS*	15.64	-	-	-	-	15.64	-	-	-	-	15.64	-	-	-	-
RICE*	19.90	0.08	250.70	54.00	17.60	38.50	0.15	178.10	125.30	13.98	29.20	0.12	214.40	89.65	15.79
SRTF LDAR*	22.24	-	-	-	-	28.37	-	-	-	-	25.31	-	-	-	-
SRTF FLARE*	0.39	0.01	0.19	1.03	-	0.39	0.00	0.19	1.03	-	0.39	0.00	0.19	1.03	-
TANKS**	176.20	-	-	-	-	159.95	-	-	-	-	168.08	-	-	-	-
SRTF TANKS**	66.80	-	-	-	-	68.40	-	-	-	-	67.60	-	-	-	-
WWTP	61.53	-	-	-	-	51.64	-	-	-	-	56.58	-	-	-	-
SRTF WWTP	0.93	-	-	-	-	2.29	-	-	-	-	1.61	-	-	-	-
GP BARGE LOADING (MVRU)	8.34	-	35.28	2.05	0.31	8.35	-	36.89	2.15	0.32	8.34	-	36.08	2.10	0.31
PB WHARF	31.51	-	-	-	-	33.44	-	-	-	-	32.48	-	-	-	-
GP BUTANE/PP LOADING	1.03	-	-	-	-	1.04	-	-	-	-	1.04	-	-	-	-
Sulfur Recovery Unit	-	14.11	4.36	171.33	-	-	10.37	4.83	189.98	-	-	12.24	4.59	180.66	-
Total Increases	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculation Formula											= Average(A,F)	= Average(B,G)	= Average(C,H)	= Average(D,I)	= Average(E,J)

* Emissions not impacted by throughput change

** For Tanks working losses are approximately 4% of emissions and will increase by throughput change:

Expected increases for plan approval from tanks = $0.96 + .04 * 1.16 = 1.0064$

Capable increases from baseline for tanks = $0.96 + .04 * 1.09 = 1.0035$

*** Only capable % increases that are greater than zero are subtracted from the expected % increases.

Note: 868 and 1232 FCCUs are generally operated at optimal rates and feed purchased (or transferred from MH) in 2010-11 will be replaced by increased production at 137 and 210 and should therefore show no significant change in emissions in the future.

PES Refinery
 Heater Firing Rate Increase Plan Appro
 Emission Estimates for Ancillary
 Upstream/Downstream Units

Source	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	
	Expected increases from this plan approval (%)					Capable increases from baseline (%)					Projected Future Actual Emissions (TPY)***					Emissions Increases from Plan Approval (TPY)					
	VOC	SOx	NOx	CO	PM	VOC	SOx	NOx	CO	PM	VOC	SOx	NOx	CO	PM	VOC	SOx	NOx	CO	PM	
LDAR*	-	-	-	-	-	-	-	-	-	-	175.44	-	-	-	-	0	-	-	-	-	
COOLING TOWERS*	-	-	-	-	-	-	-	-	-	-	50.18	-	-	-	-	31.79	0	-	-	0	
FLARES*	-	-	-	-	-	-	-	-	-	-	33.99	0.17	16.49	89.75	-	0	0	0	0	-	
SAMPLING SYSTEMS*	-	-	-	-	-	-	-	-	-	-	15.64	-	-	-	-	0	-	-	-	-	
RICE*	-	-	-	-	-	-	-	-	-	-	29.20	0.12	214.40	89.65	15.79	0	0	0	0	0	
SRTF LDAR*	-	-	-	-	-	-	-	-	-	-	25.31	-	-	-	-	0	-	-	-	-	
SRTF FLARE*	-	-	-	-	-	-	-	-	-	-	0.39	0.00	0.19	1.03	-	0	0	0	0	-	
TANKS**	0.64%	-	-	-	-	0.35%	-	-	-	-	168.56	-	-	-	-	0.49	-	-	-	-	
SRTF TANKS**	0.64%	-	-	-	-	0.35%	-	-	-	-	67.80	-	-	-	-	0.20	-	-	-	-	
WWTP	16%	-	-	-	-	9%	-	-	-	-	60.70	-	-	-	-	4.12	-	-	-	-	
SRTF WWTP	7%	-	-	-	-	6%	-	-	-	-	1.63	-	-	-	-	0.02	-	-	-	-	
GP BARGE LOADING (MVRU)	23%	-	23%	23%	23%	11%	-	11%	11%	11%	9.33	-	40.35	2.35	0.35	0.99	-	4.27	0.25	0.04	
PB WHARF	7%	-	-	-	-	6%	-	-	-	-	32.85	-	-	-	-	0.37	-	-	-	-	
GP BUTANE/PP LOADING	23%	-	-	-	-	11%	-	-	-	-	1.16	-	-	-	-	0.12	-	-	-	-	
Sulfur Recovery Unit	-	16%	16%	16%	-	-	9%	9%	9%	-	-	13.13	4.93	193.80	-	-	0.89	0.33	13.14	-	-
Total Increases	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.30	0.89	4.60	13.39	0.04	
Calculation Formula						$= K * (I + (P - U))$					$= L * (I + (Q - V))$					$= M * (I + (R - W))$					
						$= N * (I + (S - X))$					$= O * (I + (T - Y))$					$= Z - K$					
						$= AA - L$					$= AB - M$					$= AC - N$					
						$= AD - O$															

Crude Increase Basis					
Crude Unit	2010-11 Actual Rate (MBPD)	Capable Rate - January 2010 (MBPD)	Capable increase from baseline (%)	Future Projected Actual Rate (MBPD)	Expected increase from this plan approval (%)
GP-137	163.2	180.7	111%	200.0	123%
PB-210	121.2	128.6	106%	130.0	107%
TOTAL	284.4	309.3	109%	330.0	116%

Unit	Heater	2010 ACTUAL EMISSIONS (TPY)					2011 ACTUAL EMISSIONS (TPY)					2010-11 Average ACTUAL EMISSIONS (TPY)							
		SOx	NOx	CO	PM	VOC	Lead	SOx	NOx	CO	PM	VOC	Lead	SOx	NOx	CO	PM	VOC	Lead
137	F-2	0.87	48.73	26.70	2.41	1.75	1.6E-04	0.97	37.33	24.06	2.18	1.58	1.5E-04	0.92	43.03	25.38	2.29	1.67	1.5E-04
137	F-3	0.41	6.91	12.20	1.11	0.80	7.3E-05	0.50	6.42	11.61	1.05	0.76	7.2E-05	0.45	6.67	11.91	1.08	0.78	7.2E-05
210	13H-1	1.60	87.40	52.40	4.72	3.43	3.1E-04	1.23	83.80	50.30	4.55	3.30	3.4E-04	1.42	85.60	51.35	4.64	3.37	3.3E-04
1332	H-400**	2.25	66.10	40.06	3.62	2.62	2.4E-04	0.45	14.00	46.17	4.18	3.02	2.8E-04	0.45	14.00	46.17	4.18	3.02	2.8E-04
1332	H-401**	2.73	84.10	49.78	4.50	3.26	3.0E-04	0.59	17.84	62.19	5.63	4.07	3.7E-04	0.59	17.84	62.19	5.63	4.07	3.7E-04
1332	H-601	0.43	4.03	6.69	0.61	0.44	4.0E-05	0.03	4.78	7.83	0.71	0.51	4.8E-05	0.23	4.40	7.26	0.66	0.48	4.4E-05
1332	H-602	0.66	7.62	12.78	1.16	0.84	7.6E-05	0.16	9.30	15.53	1.41	1.02	9.3E-05	0.41	8.46	14.16	1.28	0.93	8.5E-05
1332	H-1	0.05	0.03	0.05	0.00	0.00	3.1E-07	0.00	0.22	0.36	0.03	0.02	2.2E-06	0.03	0.12	0.20	0.02	0.01	1.2E-06
1332	H-2	0.52	4.25	1.37	0.98	0.71	6.2E-05	0.00	4.98	1.61	1.19	0.86	7.8E-05	0.26	4.61	1.49	1.08	0.78	7.0E-05
1332	H-3	0.39	3.88	6.48	0.59	0.42	3.9E-05	0.08	5.43	9.03	0.82	0.59	5.4E-05	0.24	4.66	7.76	0.70	0.51	4.7E-05
860	2H2	0.40	8.71	14.32	1.30	0.94	8.7E-05	0.65	8.47	12.60	1.14	0.82	8.5E-05	0.53	8.59	13.46	1.22	0.88	8.6E-05
860	2H3	1.01	61.55	36.19	3.27	2.37	2.2E-04	1.76	64.20	34.00	3.08	2.23	2.3E-04	1.38	62.88	35.09	3.18	2.30	2.2E-04
860	2H4	0.52	11.41	18.73	1.69	1.23	1.1E-04	0.90	11.70	17.40	1.58	1.14	1.2E-04	0.71	11.55	18.07	1.64	1.18	1.2E-04
860	2H5	1.13	69.59	40.83	3.69	2.67	2.5E-04	1.81	65.70	34.90	3.16	2.28	2.3E-04	1.47	67.65	37.86	3.43	2.48	2.4E-04
860	2H7	0.42	9.24	15.23	1.38	1.00	9.2E-05	0.64	8.31	12.40	1.12	0.81	8.3E-05	0.53	8.77	13.81	1.25	0.90	8.8E-05
860	2H8	0.01	7.80	12.59	1.14	0.82	7.8E-05	0.03	6.92	11.10	1.01	0.73	6.8E-05	0.02	7.36	11.85	1.07	0.78	7.3E-05
864	PH1	0.45	9.17	14.84	1.34	0.97	9.2E-05	0.14	8.02	13.70	1.24	0.90	4.5E-05	0.29	8.59	14.27	1.29	0.94	6.8E-05
864	PH7	0.23	4.70	7.62	0.69	0.50	4.7E-05	0.07	4.49	7.71	0.70	0.51	7.4E-05	0.15	4.60	7.66	0.69	0.50	6.1E-05
864	PH11	0.44	8.91	14.44	1.31	0.95	8.9E-05	0.12	7.44	12.80	1.16	0.84	6.6E-05	0.28	8.18	13.62	1.23	0.89	7.8E-05
864	PH12	0.37	7.59	12.29	1.11	0.80	7.6E-05	0.13	6.61	11.40	1.03	0.74	1.1E-04	0.25	7.10	11.84	1.07	0.77	9.0E-05
859	IH1	0.90	6.98	9.98	2.48	1.81	1.7E-04	0.79	5.44	7.77	2.07	1.49	1.0E+00	0.84	6.21	8.88	2.27	1.65	8.3E-05
870	H-01	0.05	4.09	5.29	0.88	0.06	0.0E+00	0.11	4.07	0.03	0.88	0.06	0.0E+00	0.08	4.08	2.66	0.88	0.06	0.0E+00
433	H-1	2.43	7.97	42.40	3.83	2.77	2.5E-04	0.25	14.98	55.66	5.04	3.64	3.4E-04	1.34	11.48	49.03	4.43	3.21	2.9E-04
1232	B-104	0.01	0.29	0.45	0.04	0.03	2.9E-06	0.07	0.99	1.69	0.15	0.11	9.8E-06	0.04	0.64	1.07	0.10	0.07	6.4E-06
870	H-02	0.23	4.22	0.08	0.38	0.14	0.0E+00	0.36	3.63	0.03	0.33	0.12	0.0E+00	0.30	3.93	0.06	0.35	0.13	0.0E+00
Calculation Formula		= Average(A,G) = Average(B,H) = Average(C,I) = Average(D,J) = Average(E,K) = Average(F,L)																	
Heater Total		18.50	535.26	453.79	44.24	31.33	2.9E-03	11.83	405.06	461.88	45.40	32.15	2.9E-03	13.20	410.98	467.10	45.66	32.34	3.0E-03
No. 3 Boilerhouse		12.91	199.60	316.24	30.57	30.57	2.3E-03	6.53	156.50	330.40	29.90	21.60	1.9E-03	9.72	178.05	323.32	30.24	26.09	2.1E-03
Calculation Formula		= Average(A,G) = Average(B,H) = Average(C,I) = Average(D,J) = Average(E,K) = Average(F,L)																	
Heater/Boiler Total		31.41	734.86	770.03	74.81	61.90	5.2E-03	18.36	561.56	792.28	75.30	53.75	4.9E-03	22.92	589.03	790.42	75.89	58.43	5.1E-03

* Only capable % increases that are greater than zero are subtracted from the expected % increases.

** Future projected emissions are only based on 2011 actual emissions because of the SCR install in January 2011

		Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN
Unit	Heater	Expected increases from this plan approval (%)						Capable increases from baseline (%)						Projected Future Actual Emissions (TPY)*						Emissions Increases from Plan Approval (TPY)					
		SOx	NOx	CO	PM	VOC	Lead	SOx	NOx	CO	PM	VOC	Lead	SOx	NOx	CO	PM	VOC	Lead	SOx	NOx	CO	PM	VOC	Lead
137	F-2	23%	23%	23%	23%	23%	23%	11%	11%	11%	11%	11%	11%	1.03	48.12	28.38	2.57	1.86	1.7E-04	0.11	5.09	3.00	0.27	0.20	1.8E-05
137	F-3	23%	23%	23%	23%	23%	23%	11%	11%	11%	11%	11%	11%	0.51	7.45	13.31	1.21	0.87	8.1E-05	0.05	0.79	1.41	0.13	0.09	8.6E-06
210	13H-1	7%	7%	7%	7%	7%	6%	6%	6%	6%	6%	6%	6%	1.43	86.58	51.94	4.69	3.40	3.3E-04	0.02	0.98	0.59	0.05	0.04	3.8E-06
1332	H-400**	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.48	15.02	49.53	4.48	3.24	3.0E-04	0.03	1.02	3.36	0.30	0.22	2.0E-05
1332	H-401**	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.63	19.14	66.71	6.04	4.37	4.0E-04	0.04	1.30	4.52	0.41	0.30	2.7E-05
1332	H-601	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.24	4.73	7.79	0.70	0.51	4.7E-05	0.02	0.32	0.53	0.05	0.03	3.2E-06
1332	H-602	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.44	9.08	15.19	1.37	0.99	9.1E-05	0.03	0.62	1.03	0.09	0.07	6.2E-06
1332	H-1	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.03	0.13	0.22	0.02	0.01	1.3E-06	0.00	0.01	0.01	0.00	0.00	9.0E-08
1332	H-2	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.28	4.95	1.60	1.16	0.84	7.5E-05	0.02	0.34	0.11	0.08	0.06	5.1E-06
1332	H-3	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.25	5.00	8.32	0.75	0.55	5.0E-05	0.02	0.34	0.56	0.05	0.04	3.4E-06
860	2H2	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.57	9.21	14.44	1.31	0.95	9.2E-05	0.04	0.62	0.98	0.09	0.06	6.2E-06
860	2H3	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	1.48	67.45	37.65	3.41	2.47	2.4E-04	0.10	4.57	2.55	0.23	0.17	1.6E-05
860	2H4	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.76	12.40	19.38	1.75	1.27	1.2E-04	0.05	0.84	1.31	0.12	0.09	8.4E-06
860	2H5	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	1.58	72.57	40.62	3.67	2.66	2.6E-04	0.11	4.92	2.75	0.25	0.18	1.8E-05
860	2H7	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.57	9.41	14.82	1.34	0.97	9.4E-05	0.04	0.64	1.00	0.09	0.07	6.4E-06
860	2H8	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.02	7.89	12.71	1.15	0.83	7.8E-05	0.00	0.54	0.86	0.08	0.06	5.3E-06
864	PH1	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.31	9.22	15.31	1.39	1.00	7.3E-05	0.02	0.63	1.04	0.09	0.07	5.0E-06
864	PH7	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.16	4.93	8.22	0.74	0.54	6.5E-05	0.01	0.33	0.56	0.05	0.04	4.4E-06
864	PH11	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.30	8.77	14.61	1.32	0.96	8.3E-05	0.02	0.59	0.99	0.09	0.06	5.6E-06
864	PH12	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.27	7.61	12.70	1.15	0.83	9.7E-05	0.02	0.52	0.86	0.08	0.06	6.6E-06
859	IH1	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.91	6.66	9.52	2.44	1.77	8.9E-05	0.06	0.45	0.65	0.17	0.12	6.0E-06
870	H-01	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.09	4.38	2.85	0.94	0.06	0.0E+00	0.01	0.30	0.19	0.06	0.00	0.0E+00
433	H-1	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	1.44	12.31	52.60	4.76	3.44	3.1E-04	0.10	0.83	3.57	0.32	0.23	2.1E-05
1232	B-104	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.04	0.68	1.15	0.10	0.08	6.8E-06	0.00	0.05	0.08	0.01	0.01	4.6E-07
870	H-02	16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	0.32	4.21	0.06	0.38	0.14	0.0E+00	0.02	0.29	0.00	0.03	0.01	0.0E+00
Calculation Formula		$= M * (1 + (Q - W)) = N * (1 + (R - X)) = O * (1 + (S - Y)) = P * (1 + (T - Z)) = Q * (1 + (U - AA)) = R * (1 + (V - AB)) = AC * M = AD - N = AE - O = AF - N = AG - O = AH - P$												14.13	437.89	499.63	48.85	34.60	3.2E-03	0.94	26.92	32.53	3.19	2.26	2.1E-04
Heater Total		$= M * (1 + (Q - W)) = N * (1 + (R - X)) = O * (1 + (S - Y)) = P * (1 + (T - Z)) = Q * (1 + (U - AA)) = R * (1 + (V - AB)) = AC * M = AD - N = AE - O = AF - N = AG - O = AH - P$												24.56	628.90	846.47	81.28	62.58	5.4E-03	1.64	39.87	56.06	5.39	4.16	3.6E-04
No. 3 Boilerhouse		16%	16%	16%	16%	16%	16%	9%	9%	9%	9%	9%	9%	10.43	191.00	346.84	32.43	27.98	2.3E-03	0.71	12.95	23.52	2.20	1.90	1.5E-04
Calculation Formula		$= M * (1 + (Q - W)) = N * (1 + (R - X)) = O * (1 + (S - Y)) = P * (1 + (T - Z)) = Q * (1 + (U - AA)) = R * (1 + (V - AB)) = AC * M = AD - N = AE - O = AF - N = AG - O = AH - P$																							
Heater/Boiler Total		$= M * (1 + (Q - W)) = N * (1 + (R - X)) = O * (1 + (S - Y)) = P * (1 + (T - Z)) = Q * (1 + (U - AA)) = R * (1 + (V - AB)) = AC * M = AD - N = AE - O = AF - N = AG - O = AH - P$																							

PES Refinery

Heater Firing Rate Increase Plan Approval

Greenhouse Gas Emission Estimates for Ancillary Units

Crude Increase Basis

Crude Unit	2010-11 Actual Rate (MBPD)	Capable Rate - January 2010 (MBPD)	Capable increase from baseline (%)	Future Projected Actual Rate (MBPD)	Expected increase from this plan approval (%)
GP-137	163.2	180.7	111%	200.0	123%
PB-210	121.2	128.6	106%	130.0	107%
TOTAL	284.40	309.3	109%	330.0	116%

	A	B	C	D	E	F	G
Source	GHGe Report 2010 (mtons)	GHGe Report 2011 (mtons)	GHGe Average 2010/2011 (mtons)	GHGe Capable Increases from Baseline (%)	Expected increase from this plan approval (%)	Projected Future Actual Emissions (mton/year)*	Emissions Increases from Plan Approval (mton/year)
137 Unit Except F-1	50,627	44,637	47,632	11%	23%	53,266	5,634
210 Unit Except H101 & H201A/B	90,715	76,739	83,727	6%	7%	84,687	960
All Other (non-targeted) Heaters/Boiler	1,054,333	1,056,280	1,055,307	9%	16%	1,132,084	76,778
Unit 867 SRU	16,773	19,255	18,014	9%	16%	19,325	1,311
Girard Point MVRU	19,748	19,748	19,748	9%	16%	21,185	1,437
All LDAR	496	496	496	-	-	496	0
All Tanks	259	249	254	0.35%	0.64%	255	0.7
All Flares	45,068	17,138	31,103	-	-	31,103	0
Total	1,278,019	1,234,542	1,256,281			1,342,400	86,120
Calculation Formula			= Average(A,B)			= C * (1 + (E-D))	= F - C

* Only capable % increases that are greater than zero are subtracted from the expected % increases.

Attachment D
Refinery Crude Throughput Data

PES Refinery

Heater Firing Rate Increase Plan Approval

Refinery Monthly Average Crude Throughput

Date	137 Crude	210 Crude	Days/month	137 Crude	210 Crude	Total
	MBbl/month	MBbl/month		MBbl/day	MBbl/day	MBbl/day
Jan-06	5,821	4,334	31	187.8	139.8	327.6
Feb-06	3,591	3,575	28	128.3	127.7	255.9
Mar-06	4,583	4,344	31	147.9	140.1	288.0
Apr-06	5,916	4,348	30	197.2	144.9	342.1
May-06	5,888	4,494	31	189.9	145.0	334.9
Jun-06	4,537	4,351	30	151.2	145.0	296.3
Jul-06	3,618	4,096	31	116.7	132.1	248.8
Aug-06	6,159	4,108	31	198.7	132.5	331.2
Sep-06	5,386	4,027	30	179.5	134.2	313.8
Oct-06	3,589	4,314	31	115.8	139.2	254.9
Nov-06	5,769	3,829	30	192.3	127.6	319.9
Dec-06	5,868	3,848	31	189.3	124.1	313.4
Jan-07	6,035	3,864	31	194.7	124.7	319.3
Feb-07	3,793	3,387	28	135.5	121.0	256.4
Mar-07	635	3,926	31	20.5	126.7	147.2
Apr-07	4,831	3,520	30	161.0	117.3	278.4
May-07	6,061	3,995	31	195.5	128.9	324.4
Jun-07	5,740	3,570	30	191.3	119.0	310.3
Jul-07	6,057	3,869	31	195.4	124.8	320.2
Aug-07	6,163	4,049	31	198.8	130.6	329.4
Sep-07	5,940	4,077	30	198.0	135.9	333.9
Oct-07	6,106	4,150	31	197.0	133.9	330.8
Nov-07	5,859	3,829	30	195.3	127.6	322.9
Dec-07	5,868	3,886	31	189.3	125.4	314.6
Jan-08	5,901	3,836	31	190.4	123.7	314.1
Feb-08	5,487	3,211	28	195.9	114.7	310.6
Mar-08	5,798	1,749	31	187.0	56.4	243.4
Apr-08	5,354	2,394	30	178.5	79.8	258.3
May-08	2,821	3,811	31	91.0	122.9	213.9
Jun-08	4,944	3,503	30	164.8	116.8	281.6
Jul-08	5,730	3,518	31	184.8	113.5	298.3
Aug-08	5,815	3,532	31	187.6	113.9	301.5
Sep-08	5,413	3,331	30	180.4	111.0	291.5
Oct-08	5,514	3,840	31	177.9	123.9	301.7
Nov-08	5,297	3,206	30	176.6	106.9	283.4
Dec-08	5,288	3,337	31	170.6	107.6	278.2
Jan-09	5,180	3,156	31	167.1	101.8	268.9
Feb-09	4,575	2,667	28	163.4	95.3	258.6
Mar-09	4,960	3,048	31	160.0	98.3	258.3
Apr-09	4,868	2,950	30	162.3	98.3	260.6
May-09	5,491	2,158	31	177.1	69.6	246.7
Jun-09	4,849	3,063	30	161.6	102.1	263.7

PES Refinery

Heater Firing Rate Increase Plan Approval

Refinery Monthly Average Crude Throughput

Date	137 Crude	210 Crude	Days/month	137 Crude	210 Crude	Total
	MBbl/month	MBbl/month		MBbl/day	MBbl/day	MBbl/day
Jul-09	5,379	3,291	31	173.5	106.2	279.7
Aug-09	4,013	3,042	31	129.4	98.1	227.6
Sep-09	4,754	3,113	30	158.5	103.8	262.2
Oct-09	5,583	3,384	31	180.1	109.2	289.2
Nov-09	5,399	3,201	30	180.0	106.7	286.6
Dec-09	5,448	3,838	31	175.7	123.8	299.6
Jan-10	5,602	3,987	31	180.7	128.6	309.3
Feb-10	4,930	3,451	28	176.1	123.3	299.4
Mar-10	5,304	3,700	31	171.1	119.4	290.5
Apr-10	5,530	3,797	30	184.3	126.6	310.9
May-10	5,660	4,114	31	182.6	132.7	315.3
Jun-10	5,313	4,183	30	177.1	139.4	316.5
Jul-10	5,548	4,116	31	179.0	132.8	311.7
Aug-10	5,502	4,220	31	177.5	136.1	313.6
Sep-10	5,160	3,839	30	172.0	128.0	300.0
Oct-10	4,664	3,834	31	150.5	123.7	274.1
Nov-10	3,957	3,885	30	131.9	129.5	261.4
Dec-10	3,989	3,697	31	128.7	119.3	248.0
Jan-11	5,314	3,750	31	171.4	121.0	292.4
Feb-11	1,658	3,254	28	59.2	116.2	175.4
Mar-11	3,344	3,290	31	107.9	106.1	214.0
Apr-11	3,525	3,091	30	117.5	103.0	220.5
May-11	5,696	3,596	31	183.8	116.0	299.7
Jun-11	5,418	3,493	30	180.6	116.4	297.0
Jul-11	5,801	3,681	31	187.1	118.7	305.9
Aug-11	5,134	3,364	31	165.6	108.5	274.1
Sep-11	5,165	3,401	30	172.2	113.4	285.5
Oct-11	5,812	3,678	31	187.5	118.6	306.1
Nov-11	5,415	3,508	30	180.5	116.9	297.4
Dec-11	5,699	3,562	31	183.8	114.9	298.7
Jan-12	5,671	3,432	31	182.9	110.7	293.6
Feb-12	5,081	3,331	28	181.5	119.0	300.4
Mar-12	5,596	3,591	31	180.5	115.8	296.3
Apr-12	5,589	3,504	30	186.3	116.8	303.1
May-12	3,950	3,818	31	127.4	123.2	250.6
Jun-12	5,315	3,588	30	177.2	119.6	296.8
Jul-12	5,329	3,572	31	171.9	115.2	287.1
Aug-12	5,356	3,717	31	172.8	119.9	292.7
Sep-12	5,540	3,448	30	184.7	114.9	299.6
Oct-12	5,750	3,657	31	185.5	118.0	303.4
Nov-12	5,559	3,401	30	185.3	113.4	298.7
Dec-12	4,990	3,075	31	161.0	99.2	260.2

PES Refinery

Heater Firing Rate Increase Plan Approval

Refinery Daily Average Crude Throughput

Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2006	1	196543	138830	196.5	138.8	335.4
2006	2	197331	139801	197.3	139.8	337.1
2006	3	196822	138778	196.8	138.8	335.6
2006	4	194120	140250	194.1	140.3	334.4
2006	5	177675	140507	177.7	140.5	318.2
2006	6	193966	140428	194.0	140.4	334.4
2006	7	194833	140898	194.8	140.9	335.7
2006	8	194685	140453	194.7	140.5	335.1
2006	9	193771	141406	193.8	141.4	335.2
2006	10	193746	140551	193.7	140.6	334.3
2006	11	194416	140079	194.4	140.1	334.5
2006	12	194765	140131	194.8	140.1	334.9
2006	13	178602	141058	178.6	141.1	319.7
2006	14	158038	140686	158.0	140.7	298.7
2006	15	155314	140592	155.3	140.6	295.9
2006	16	160073	139045	160.1	139.0	299.1
2006	17	155416	139490	155.4	139.5	294.9
2006	18	165333	139105	165.3	139.1	304.4
2006	19	173063	140583	173.1	140.6	313.6
2006	20	175325	141885	175.3	141.9	317.2
2006	21	173021	141296	173.0	141.3	314.3
2006	22	193332	140722	193.3	140.7	334.1
2006	23	199804	141944	199.8	141.9	341.7
2006	24	200064	142246	200.1	142.2	342.3
2006	25	201096	141931	201.1	141.9	343.0
2006	26	199634	137711	199.6	137.7	337.3
2006	27	203113	136823	203.1	136.8	339.9
2006	28	202384	136782	202.4	136.8	339.2
2006	29	202879	140407	202.9	140.4	343.3
2006	30	201136	136936	201.1	136.9	338.1
2006	31	200748	132492	200.7	132.5	333.2
2006	32	200858	133214	200.9	133.2	334.1
2006	33	198678	135761	198.7	135.8	334.4
2006	34	197943	133903	197.9	133.9	331.8
2006	35	199949	131402	199.9	131.4	331.4
2006	36	200989	132132	201.0	132.1	333.1
2006	37	205267	133775	205.3	133.8	339.0
2006	38	206141	134922	206.1	134.9	341.1
2006	39	204635	137583	204.6	137.6	342.2
2006	40	204249	136222	204.2	136.2	340.5
2006	41	198578	140037	198.6	140.0	338.6
2006	42	199112	139994	199.1	140.0	339.1
2006	43	200083	140034	200.1	140.0	340.1
2006	44	200284	107478	200.3	107.5	307.8
2006	45	199349	100026	199.3	100.0	299.4
2006	46	181399	100029	181.4	100.0	281.4
2006	47	176961	99628	177.0	99.6	276.6
2006	48	174820	100634	174.8	100.6	275.5
2006	49	173719	100275	173.7	100.3	274.0
2006	50	68064	101509	68.1	101.5	169.6
2006	51	0	125564	0.0	125.6	125.6
2006	52	0	138708	0.0	138.7	138.7
2006	53	0	139093	0.0	139.1	139.1
2006	54	0	139105	0.0	139.1	139.1
2006	55	0	138691	0.0	138.7	138.7
2006	56	0	137785	0.0	137.8	137.8
2006	57	0	137599	0.0	137.6	137.6
2006	58	0	140043	0.0	140.0	140.0
2006	59	0	140232	0.0	140.2	140.2
2006	60	0	141323	0.0	141.3	141.3
2006	61	131	141260	0.1	141.3	141.4
2006	62	8307	141412	8.3	141.4	149.7
2006	63	44919	142048	44.9	142.0	187.0
2006	64	125385	142038	125.4	142.0	267.4
2006	65	172688	142041	172.7	142.0	314.7
2006	66	187294	141807	187.3	141.8	329.1
2006	67	190917	141739	190.9	141.7	332.7
2006	68	196627	123529	196.6	123.5	320.2
2006	69	198361	139991	198.4	140.0	338.4
2006	70	179755	139409	179.8	139.4	319.2
2006	71	186133	132940	186.1	132.9	319.1
2006	72	201130	140502	201.1	140.5	341.6
2006	73	202006	142047	202.0	142.0	344.1
2006	74	197197	142047	197.2	142.0	339.2
2006	75	192719	142053	192.7	142.1	334.8
2006	76	197001	142046	197.0	142.0	339.0

MBBL	Frequency (Days)
GP >200	146
PB >130	602
Total >330	253

Total MBBL	Frequency (Days)
310	1696
315	180
320	150
325	167
330	111
335	95

PES Refinery

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Refinery Daily Average Crude Throughput

Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2006	77	198057	142046	198.1	142.0	340.1
2006	78	198838	142046	198.8	142.0	340.9
2006	79	199231	142056	199.2	142.1	341.3
2006	80	201498	141409	201.5	141.4	342.9
2006	81	199035	142063	199.0	142.1	341.1
2006	82	199403	141303	199.4	141.3	340.7
2006	83	197740	142050	197.7	142.0	339.8
2006	84	195699	140005	195.7	140.0	335.7
2006	85	196709	135129	196.7	135.1	331.8
2006	86	172151	131734	172.2	131.7	303.9
2006	87	30606	140389	30.6	140.4	171.0
2006	88	30193	141483	30.2	141.5	171.7
2006	89	28995	142295	29.0	142.3	171.3
2006	90	54740	142028	54.7	142.0	196.8
2006	91	111077	142064	111.1	142.1	253.1
2006	92	181406	142817	181.4	142.8	324.2
2006	93	192184	143753	192.2	143.8	335.9
2006	94	195246	143734	195.2	143.7	339.0
2006	95	196068	143869	196.1	143.9	339.9
2006	96	199942	144534	199.9	144.5	344.5
2006	97	202164	144537	202.2	144.5	346.7
2006	98	199591	144529	199.6	144.5	344.1
2006	99	200708	144544	200.7	144.5	345.3
2006	100	199449	144540	199.4	144.5	344.0
2006	101	199897	143560	199.9	143.6	343.5
2006	102	202802	141646	202.8	141.6	344.4
2006	103	204091	142220	204.1	142.2	346.3
2006	104	202728	141569	202.7	141.6	344.3
2006	105	201743	145344	201.7	145.3	347.1
2006	106	200935	144623	200.9	144.6	345.6
2006	107	199212	145328	199.2	145.3	344.5
2006	108	201142	146582	201.1	146.6	347.7
2006	109	201475	146194	201.5	146.2	347.7
2006	110	201675	146664	201.7	146.7	348.3
2006	111	200808	146522	200.8	146.5	347.3
2006	112	202205	145142	202.2	145.1	347.3
2006	113	203716	143980	203.7	144.0	347.7
2006	114	204543	145864	204.5	145.9	350.4
2006	115	201285	149010	201.3	149.0	350.3
2006	116	202645	149326	202.6	149.3	352.0
2006	117	203783	146863	203.8	146.9	350.6
2006	118	201804	145441	201.8	145.4	347.2
2006	119	199651	144014	199.7	144.0	343.7
2006	120	201528	149094	201.5	149.1	350.6
2006	121	202165	150020	202.2	150.0	352.2
2006	122	199619	144963	199.6	145.0	344.6
2006	123	202307	139372	202.3	139.4	341.7
2006	124	199329	136804	199.3	136.8	336.1
2006	125	199491	137939	199.5	137.9	337.4
2006	126	199929	137952	199.9	138.0	337.9
2006	127	200966	138875	201.0	138.9	339.8
2006	128	202426	143013	202.4	143.0	345.4
2006	129	204150	144677	204.1	144.7	348.8
2006	130	203462	146380	203.5	146.4	349.8
2006	131	205395	147263	205.4	147.3	352.7
2006	132	203699	146527	203.7	146.5	350.2
2006	133	202890	146846	202.9	146.8	349.7
2006	134	202076	146741	202.1	146.7	348.8
2006	135	202984	147787	203.0	147.8	350.8
2006	136	154175	148773	154.2	148.8	302.9
2006	137	96301	148824	96.3	148.8	245.1
2006	138	200923	147482	200.9	147.5	348.4
2006	139	165325	147129	165.3	147.1	312.5
2006	140	196958	147010	197.0	147.0	344.0
2006	141	193489	147566	193.5	147.6	341.1
2006	142	184618	147117	184.6	147.1	331.7
2006	143	182782	146973	182.8	147.0	329.8
2006	144	185775	147458	185.8	147.5	333.2
2006	145	187931	146240	187.9	146.2	334.2
2006	146	185911	142009	185.9	142.0	327.9
2006	147	185857	139998	185.9	140.0	325.9
2006	148	184689	142056	184.7	142.1	326.7
2006	149	184691	145741	184.7	145.7	330.4
2006	150	183763	147000	183.8	147.0	330.8
2006	151	183842	147895	183.8	147.9	331.7
2006	152	183529	142122	183.5	142.1	325.7

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Refinery Daily Average Crude Throughput

Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2006	153	183817	136683	183.8	136.7	320.5
2006	154	184924	137221	184.9	137.2	322.1
2006	155	182334	141508	182.3	141.5	323.8
2006	156	181188	142190	181.2	142.2	323.4
2006	157	182461	141791	182.5	141.8	324.3
2006	158	184847	142156	184.8	142.2	327.0
2006	159	185978	140972	186.0	141.0	326.9
2006	160	186755	141683	186.8	141.7	328.4
2006	161	188971	143508	189.0	143.5	332.5
2006	162	188360	148107	188.4	148.1	336.5
2006	163	186910	149423	186.9	149.4	336.3
2006	164	182354	148810	182.4	148.8	331.2
2006	165	181670	144290	181.7	144.3	326.0
2006	166	183575	146988	183.6	147.0	330.6
2006	167	183164	149479	183.2	149.5	332.6
2006	168	181128	145483	181.1	145.5	326.6
2006	169	179810	145315	179.8	145.3	325.1
2006	170	180396	144272	180.4	144.3	324.7
2006	171	157190	143226	157.2	143.2	300.4
2006	172	137139	145932	137.1	145.9	283.1
2006	173	135708	147418	135.7	147.4	283.1
2006	174	148920	147204	148.9	147.2	296.1
2006	175	178183	149013	178.2	149.0	327.2
2006	176	166800	148587	166.8	148.6	315.4
2006	177	116921	148827	116.9	148.8	265.7
2006	178	2760	148973	2.8	149.0	151.7
2006	179	1697	147249	1.7	147.2	148.9
2006	180	0	145703	0.0	145.7	145.7
2006	181	0	146864	0.0	146.9	146.9
2006	182	3560	146761	3.6	146.8	150.3
2006	183	6231	140695	6.2	140.7	146.9
2006	184	6706	142350	6.7	142.4	149.1
2006	185	5993	144335	6.0	144.3	150.3
2006	186	5843	147341	5.8	147.3	153.2
2006	187	296	148230	0.3	148.2	148.5
2006	188	1537	147525	1.5	147.5	149.1
2006	189	6032	147312	6.0	147.3	153.3
2006	190	2675	144021	2.7	144.0	146.7
2006	191	1484	136617	1.5	136.6	138.1
2006	192	6035	139494	6.0	139.5	145.5
2006	193	37861	144706	37.9	144.7	182.6
2006	194	88909	142239	88.9	142.2	231.1
2006	195	160776	129222	160.8	129.2	290.0
2006	196	179379	99927	179.4	99.9	279.3
2006	197	188291	106338	188.3	106.3	294.6
2006	198	195100	107049	195.1	107.0	302.1
2006	199	190854	109843	190.9	109.8	300.7
2006	200	188545	137051	188.5	137.1	325.6
2006	201	189343	144715	189.3	144.7	334.1
2006	202	193601	137828	193.6	137.8	331.4
2006	203	191784	129766	191.8	129.8	321.5
2006	204	196758	129352	196.8	129.4	326.1
2006	205	195984	128782	196.0	128.8	324.8
2006	206	198814	129531	198.8	129.5	328.3
2006	207	193424	129302	193.4	129.3	322.7
2006	208	197312	118204	197.3	118.2	315.5
2006	209	196446	117295	196.4	117.3	313.7
2006	210	195486	116040	195.5	116.0	311.5
2006	211	195507	124067	195.5	124.1	319.6
2006	212	197353	129713	197.4	129.7	327.1
2006	213	199536	129931	199.5	129.9	329.5
2006	214	200416	129824	200.4	129.8	330.2
2006	215	201253	130003	201.3	130.0	331.3
2006	216	202012	130005	202.0	130.0	332.0
2006	217	199152	129668	199.2	129.7	328.8
2006	218	199990	129850	200.0	129.9	329.8
2006	219	201249	129939	201.2	129.9	331.2
2006	220	201619	129611	201.6	129.6	331.2
2006	221	201068	129772	201.1	129.8	330.8
2006	222	200922	130023	200.9	130.0	330.9
2006	223	201265	130042	201.3	130.0	331.3
2006	224	198642	125592	198.6	125.6	324.2
2006	225	200432	128417	200.4	128.4	328.8
2006	226	192736	130053	192.7	130.1	322.8
2006	227	199480	130037	199.5	130.0	329.5
2006	228	196482	136646	196.5	136.6	333.1

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2006	229	192179	140484	192.2	140.5	332.7
2006	230	192125	141637	192.1	141.6	333.8
2006	231	197914	140257	197.9	140.3	338.2
2006	232	199022	138655	199.0	138.7	337.7
2006	233	201122	141515	201.1	141.5	342.6
2006	234	202084	141784	202.1	141.8	343.9
2006	235	201318	138245	201.3	138.2	339.6
2006	236	197321	129188	197.3	129.2	326.5
2006	237	195180	126984	195.2	127.0	322.2
2006	238	186800	125056	186.8	125.1	311.9
2006	239	195023	125292	195.0	125.3	320.3
2006	240	201127	126229	201.1	126.2	327.4
2006	241	203144	135132	203.1	135.1	338.3
2006	242	201362	138531	201.4	138.5	339.9
2006	243	196921	139857	196.9	139.9	336.8
2006	244	191836	141517	191.8	141.5	333.4
2006	245	155053	126081	155.1	126.1	281.1
2006	246	143219	106591	143.2	106.6	249.8
2006	247	194353	135933	194.4	135.9	330.3
2006	248	196864	132311	196.9	132.3	329.2
2006	249	188884	107248	188.9	107.2	296.1
2006	250	188291	112924	188.3	112.9	301.2
2006	251	188182	121557	188.2	121.6	309.7
2006	252	183130	140852	183.1	140.9	324.0
2006	253	179762	141891	179.8	141.9	321.7
2006	254	186246	141823	186.2	141.8	328.1
2006	255	184796	143065	184.8	143.1	327.9
2006	256	184872	144669	184.9	144.7	329.5
2006	257	185174	145555	185.2	145.6	330.7
2006	258	185454	141939	185.5	141.9	327.4
2006	259	183227	131351	183.2	131.4	314.6
2006	260	180566	127239	180.6	127.2	307.8
2006	261	186519	127092	186.5	127.1	313.6
2006	262	188050	127505	188.0	127.5	315.6
2006	263	186851	135543	186.9	135.5	322.4
2006	264	184029	137423	184.0	137.4	321.5
2006	265	181720	135412	181.7	135.4	317.1
2006	266	182717	128322	182.7	128.3	311.0
2006	267	181906	135187	181.9	135.2	317.1
2006	268	181956	136315	182.0	136.3	318.3
2006	269	186556	139515	186.6	139.5	326.1
2006	270	187207	143793	187.2	143.8	331.0
2006	271	187305	143694	187.3	143.7	331.0
2006	272	186086	147046	186.1	147.0	333.1
2006	273	65146	147426	65.1	147.4	212.6
2006	274	7312	146782	7.3	146.8	154.1
2006	275	11183	145846	11.2	145.8	157.0
2006	276	9813	138887	9.8	138.9	148.7
2006	277	4141	128827	4.1	128.8	133.0
2006	278	5644	136554	5.6	136.6	142.2
2006	279	1832	141121	1.8	141.1	143.0
2006	280	2888	137661	2.9	137.7	140.5
2006	281	6329	140554	6.3	140.6	146.9
2006	282	7359	137020	7.4	137.0	144.4
2006	283	5157	137598	5.2	137.6	142.8
2006	284	15272	139418	15.3	139.4	154.7
2006	285	56254	136509	56.3	136.5	192.8
2006	286	111075	144200	111.1	144.2	255.3
2006	287	170598	144137	170.6	144.1	314.7
2006	288	191076	144980	191.1	145.0	336.1
2006	289	195178	145053	195.2	145.1	340.2
2006	290	193349	142036	193.3	142.0	335.4
2006	291	198411	137516	198.4	137.5	335.9
2006	292	202419	141200	202.4	141.2	343.6
2006	293	187158	140108	187.2	140.1	327.3
2006	294	187933	140171	187.9	140.2	328.1
2006	295	194164	140974	194.2	141.0	335.1
2006	296	201479	144099	201.5	144.1	345.6
2006	297	203148	144931	203.1	144.9	348.1
2006	298	202707	144186	202.7	144.2	346.9
2006	299	190253	139515	190.3	139.5	329.8
2006	300	173114	134630	173.1	134.6	307.7
2006	301	154759	130033	154.8	130.0	284.8
2006	302	154453	130044	154.5	130.0	284.5
2006	303	160500	129628	160.5	129.6	290.1
2006	304	183549	130220	183.5	130.2	313.8

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2006	305	192955	136897	193.0	136.9	329.9
2006	306	167325	125847	167.3	125.8	293.2
2006	307	157455	115036	157.5	115.0	272.5
2006	308	157664	122389	157.7	122.4	280.1
2006	309	186608	146309	186.6	146.3	332.9
2006	310	198353	138465	198.4	138.5	336.8
2006	311	203213	138943	203.2	138.9	342.2
2006	312	203342	139148	203.3	139.1	342.5
2006	313	200147	134667	200.1	134.7	334.8
2006	314	199246	124242	199.2	124.2	323.5
2006	315	201150	120758	201.1	120.8	321.9
2006	316	201148	120429	201.1	120.4	321.6
2006	317	203401	122218	203.4	122.2	325.6
2006	318	202915	128488	202.9	128.5	331.4
2006	319	202966	129663	203.0	129.7	332.6
2006	320	204080	126831	204.1	126.8	330.9
2006	321	202079	129968	202.1	130.0	332.0
2006	322	202098	128699	202.1	128.7	330.8
2006	323	201074	129618	201.1	129.6	330.7
2006	324	199763	128769	199.8	128.8	328.5
2006	325	199827	125311	199.8	125.3	325.1
2006	326	196574	125935	196.6	125.9	322.5
2006	327	196384	127197	196.4	127.2	323.6
2006	328	196418	127143	196.4	127.1	323.6
2006	329	196971	126248	197.0	126.2	323.2
2006	330	192497	119036	192.5	119.0	311.5
2006	331	174487	125650	174.5	125.6	300.1
2006	332	179875	131979	179.9	132.0	311.9
2006	333	179799	122852	179.8	122.9	302.7
2006	334	168700	109994	168.7	110.0	278.7
2006	335	166858	109914	166.9	109.9	276.8
2006	336	164703	109130	164.7	109.1	273.8
2006	337	166956	109629	167.0	109.6	276.6
2006	338	172744	115362	172.7	115.4	288.1
2006	339	175733	119165	175.7	119.2	294.9
2006	340	176730	119941	176.7	119.9	296.7
2006	341	177656	120869	177.7	120.9	298.5
2006	342	185434	127591	185.4	127.6	313.0
2006	343	176202	125416	176.2	125.4	301.6
2006	344	182205	124925	182.2	124.9	307.1
2006	345	183599	124029	183.6	124.0	307.6
2006	346	191334	124914	191.3	124.9	316.2
2006	347	195264	127281	195.3	127.3	322.5
2006	348	169915	126076	169.9	126.1	296.0
2006	349	196445	125902	196.4	125.9	322.3
2006	350	199591	125444	199.6	125.4	325.0
2006	351	201570	126333	201.6	126.3	327.9
2006	352	200037	130028	200.0	130.0	330.1
2006	353	201546	131620	201.5	131.6	333.2
2006	354	201657	131827	201.7	131.8	333.5
2006	355	202890	126686	202.9	126.7	329.6
2006	356	197459	125176	197.5	125.2	322.6
2006	357	199076	125440	199.1	125.4	324.5
2006	358	197823	126766	197.8	126.8	324.6
2006	359	193059	129493	193.1	129.5	322.6
2006	360	198211	127481	198.2	127.5	325.7
2006	361	198449	126745	198.4	126.7	325.2
2006	362	198983	125959	199.0	126.0	324.9
2006	363	199478	126530	199.5	126.5	326.0
2006	364	199389	126158	199.4	126.2	325.5
2006	365	196754	126068	196.8	126.1	322.8
2007	1	199053	126260	199.1	126.3	325.3
2007	2	201307	125213	201.3	125.2	326.5
2007	3	201830	122136	201.8	122.1	324.0
2007	4	202124	123061	202.1	123.1	325.2
2007	5	201245	125393	201.2	125.4	326.6
2007	6	199692	125401	199.7	125.4	325.1
2007	7	199063	125968	199.1	126.0	325.0
2007	8	198512	125889	198.5	125.9	324.4
2007	9	198179	127857	198.2	127.9	326.0
2007	10	199918	127085	199.9	127.1	327.0
2007	11	197705	127492	197.7	127.5	325.2
2007	12	198883	126655	198.9	126.7	325.5
2007	13	197707	126917	197.7	126.9	324.6
2007	14	193785	121455	193.8	121.5	315.2
2007	15	194070	121031	194.1	121.0	315.1

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2007	16	194637	126505	194.6	126.5	321.1
2007	17	196810	129192	196.8	129.2	326.0
2007	18	200922	129830	200.9	129.8	330.8
2007	19	192839	129888	192.8	129.9	322.7
2007	20	197909	129096	197.9	129.1	327.0
2007	21	180454	107299	180.5	107.3	287.8
2007	22	147975	104747	148.0	104.7	252.7
2007	23	180637	123683	180.6	123.7	304.3
2007	24	195360	127643	195.4	127.6	323.0
2007	25	192015	125217	192.0	125.2	317.2
2007	26	188351	123963	188.4	124.0	312.3
2007	27	196288	126406	196.3	126.4	322.7
2007	28	197678	126527	197.7	126.5	324.2
2007	29	196606	124225	196.6	124.2	320.8
2007	30	197365	126332	197.4	126.3	323.7
2007	31	196382	125792	196.4	125.8	322.2
2007	32	195717	122037	195.7	122.0	317.8
2007	33	200480	124425	200.5	124.4	324.9
2007	34	200958	122170	201.0	122.2	323.1
2007	35	202200	123582	202.2	123.6	325.8
2007	36	197798	122659	197.8	122.7	320.5
2007	37	199434	118200	199.4	118.2	317.6
2007	38	198056	118465	198.1	118.5	316.5
2007	39	176914	117603	176.9	117.6	294.5
2007	40	155436	116512	155.4	116.5	271.9
2007	41	157248	116587	157.2	116.6	273.8
2007	42	152431	115208	152.4	115.2	267.6
2007	43	149601	117376	149.6	117.4	267.0
2007	44	149371	120633	149.4	120.6	270.0
2007	45	150233	120341	150.2	120.3	270.6
2007	46	152520	116312	152.5	116.3	268.8
2007	47	151389	112352	151.4	112.4	263.7
2007	48	151021	114616	151.0	114.6	265.6
2007	49	151017	119441	151.0	119.4	270.5
2007	50	152325	117886	152.3	117.9	270.2
2007	51	154651	118138	154.7	118.1	272.8
2007	52	154182	122987	154.2	123.0	277.2
2007	53	151297	124938	151.3	124.9	276.2
2007	54	64342	127082	64.3	127.1	191.4
2007	55	5096	127787	5.1	127.8	132.9
2007	56	5879	127617	5.9	127.6	133.5
2007	57	2494	126364	2.5	126.4	128.9
2007	58	4077	127568	4.1	127.6	131.6
2007	59	6466	127981	6.5	128.0	134.4
2007	60	6459	123245	6.5	123.2	129.7
2007	61	6887	122546	6.9	122.5	129.4
2007	62	7679	123168	7.7	123.2	130.8
2007	63	8637	124199	8.6	124.2	132.8
2007	64	7720	124445	7.7	124.4	132.2
2007	65	3779	123154	3.8	123.2	126.9
2007	66	24124	123558	24.1	123.6	147.7
2007	67	28705	122808	28.7	122.8	151.5
2007	68	28173	122946	28.2	122.9	151.1
2007	69	27254	123348	27.3	123.3	150.6
2007	70	25651	117217	25.7	117.2	142.9
2007	71	28820	122862	28.8	122.9	151.7
2007	72	26707	123313	26.7	123.3	150.0
2007	73	23995	119146	24.0	119.1	143.1
2007	74	18689	117889	18.7	117.9	136.6
2007	75	21354	122622	21.4	122.6	144.0
2007	76	20858	130537	20.9	130.5	151.4
2007	77	20374	131600	20.4	131.6	152.0
2007	78	17696	134171	17.7	134.2	151.9
2007	79	17833	134433	17.8	134.4	152.3
2007	80	20096	135741	20.1	135.7	155.8
2007	81	21758	135548	21.8	135.5	157.3
2007	82	22147	135866	22.1	135.9	158.0
2007	83	23086	136414	23.1	136.4	159.5
2007	84	20631	137149	20.6	137.1	157.8
2007	85	17566	132934	17.6	132.9	150.5
2007	86	16973	125176	17.0	125.2	142.1
2007	87	15986	121633	16.0	121.6	137.6
2007	88	17418	128880	17.4	128.9	146.3
2007	89	29737	127902	29.7	127.9	157.6
2007	90	58617	121892	58.6	121.9	180.5
2007	91	112518	123228	112.5	123.2	235.7

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2007	92	138162	123097	138.2	123.1	261.3
2007	93	160463	122983	160.5	123.0	283.4
2007	94	156146	121725	156.1	121.7	277.9
2007	95	163118	122040	163.1	122.0	285.2
2007	96	163350	122949	163.3	122.9	286.3
2007	97	170634	122200	170.6	122.2	292.8
2007	98	168235	121031	168.2	121.0	289.3
2007	99	163993	118696	164.0	118.7	282.7
2007	100	163612	119526	163.6	119.5	283.1
2007	101	161155	119870	161.2	119.9	281.0
2007	102	161594	119110	161.6	119.1	280.7
2007	103	160219	118066	160.2	118.1	278.3
2007	104	159088	117418	159.1	117.4	276.5
2007	105	161292	115919	161.3	115.9	277.2
2007	106	158205	109737	158.2	109.7	267.9
2007	107	147110	99521	147.1	99.5	246.6
2007	108	140790	104191	140.8	104.2	245.0
2007	109	128493	111527	128.5	111.5	240.0
2007	110	125429	115057	125.4	115.1	240.5
2007	111	138596	109583	138.6	109.6	248.2
2007	112	152266	106412	152.3	106.4	258.7
2007	113	170466	106774	170.5	106.8	277.2
2007	114	177585	114650	177.6	114.7	292.2
2007	115	169419	113124	169.4	113.1	282.5
2007	116	169494	109969	169.5	110.0	279.5
2007	117	185080	128028	185.1	128.0	313.1
2007	118	198138	126255	198.1	126.3	324.4
2007	119	203923	127951	203.9	128.0	331.9
2007	120	202195	129352	202.2	129.4	331.5
2007	121	200989	132629	201.0	132.6	333.6
2007	122	203896	131570	203.9	131.6	335.5
2007	123	199095	131772	199.1	131.8	330.9
2007	124	200015	133073	200.0	133.1	333.1
2007	125	196756	132839	196.8	132.8	329.6
2007	126	200345	130905	200.3	130.9	331.3
2007	127	188498	132625	188.5	132.6	321.1
2007	128	195963	130143	196.0	130.1	326.1
2007	129	200529	128770	200.5	128.8	329.3
2007	130	198880	124120	198.9	124.1	323.0
2007	131	199042	122579	199.0	122.6	321.6
2007	132	199413	129846	199.4	129.8	329.3
2007	133	197176	133752	197.2	133.8	330.9
2007	134	185527	132922	185.5	132.9	318.4
2007	135	188871	132121	188.9	132.1	321.0
2007	136	175403	134709	175.4	134.7	310.1
2007	137	180126	134396	180.1	134.4	314.5
2007	138	200703	139882	200.7	139.9	340.6
2007	139	198975	141885	199.0	141.9	340.9
2007	140	200440	139824	200.4	139.8	340.3
2007	141	201752	136078	201.8	136.1	337.8
2007	142	203193	130380	203.2	130.4	333.6
2007	143	201695	124455	201.7	124.5	326.1
2007	144	201867	121864	201.9	121.9	323.7
2007	145	200620	119894	200.6	119.9	320.5
2007	146	196632	118889	196.6	118.9	315.5
2007	147	183067	118631	183.1	118.6	301.7
2007	148	179764	117427	179.8	117.4	297.2
2007	149	188122	114646	188.1	114.6	302.8
2007	150	196304	117537	196.3	117.5	313.8
2007	151	197807	124697	197.8	124.7	322.5
2007	152	197242	117869	197.2	117.9	315.1
2007	153	200641	120404	200.6	120.4	321.0
2007	154	200534	125462	200.5	125.5	326.0
2007	155	196485	129657	196.5	129.7	326.1
2007	156	200273	126724	200.3	126.7	327.0
2007	157	199961	126708	200.0	126.7	326.7
2007	158	201629	120468	201.6	120.5	322.1
2007	159	193175	112291	193.2	112.3	305.5
2007	160	198513	111310	198.5	111.3	309.8
2007	161	197664	124052	197.7	124.1	321.7
2007	162	198405	124534	198.4	124.5	322.9
2007	163	196497	125588	196.5	125.6	322.1
2007	164	138943	90911	138.9	90.9	229.9
2007	165	137376	92755	137.4	92.8	230.1
2007	166	156581	117300	156.6	117.3	273.9
2007	167	184014	126184	184.0	126.2	310.2

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2007	168	192540	123094	192.5	123.1	315.6
2007	169	196899	125107	196.9	125.1	322.0
2007	170	199122	122010	199.1	122.0	321.1
2007	171	198792	124618	198.8	124.6	323.4
2007	172	198893	127906	198.9	127.9	326.8
2007	173	200204	125845	200.2	125.8	326.0
2007	174	195909	126365	195.9	126.4	322.3
2007	175	200436	129640	200.4	129.6	330.1
2007	176	200164	122655	200.2	122.7	322.8
2007	177	193703	112545	193.7	112.5	306.2
2007	178	189759	107856	189.8	107.9	297.6
2007	179	188362	107044	188.4	107.0	295.4
2007	180	188387	109209	188.4	109.2	297.6
2007	181	198707	113954	198.7	114.0	312.7
2007	182	201256	117571	201.3	117.6	318.8
2007	183	198813	115892	198.8	115.9	314.7
2007	184	193878	120528	193.9	120.5	314.4
2007	185	191428	118107	191.4	118.1	309.5
2007	186	187930	117192	187.9	117.2	305.1
2007	187	185088	115118	185.1	115.1	300.2
2007	188	184391	117692	184.4	117.7	302.1
2007	189	186424	119029	186.4	119.0	305.5
2007	190	191345	117343	191.3	117.3	308.7
2007	191	195691	117470	195.7	117.5	313.2
2007	192	195308	127580	195.3	127.6	322.9
2007	193	197141	135691	197.1	135.7	332.8
2007	194	198728	131945	198.7	131.9	330.7
2007	195	198734	125408	198.7	125.4	324.1
2007	196	197825	124387	197.8	124.4	322.2
2007	197	197986	115840	198.0	115.8	313.8
2007	198	199280	123555	199.3	123.6	322.8
2007	199	194140	134818	194.1	134.8	329.0
2007	200	195915	138048	195.9	138.0	334.0
2007	201	199066	141858	199.1	141.9	340.9
2007	202	198885	144486	198.9	144.5	343.4
2007	203	198085	142028	198.1	142.0	340.1
2007	204	199628	137932	199.6	137.9	337.6
2007	205	199721	130570	199.7	130.6	330.3
2007	206	199507	115284	199.5	115.3	314.8
2007	207	198604	110547	198.6	110.5	309.2
2007	208	197120	118362	197.1	118.4	315.5
2007	209	191704	122988	191.7	123.0	314.7
2007	210	193467	115824	193.5	115.8	309.3
2007	211	195557	126029	195.6	126.0	321.6
2007	212	194476	129731	194.5	129.7	324.2
2007	213	193615	132283	193.6	132.3	325.9
2007	214	197526	129955	197.5	130.0	327.5
2007	215	195702	131891	195.7	131.9	327.6
2007	216	197283	125215	197.3	125.2	322.5
2007	217	200634	132543	200.6	132.5	333.2
2007	218	202018	121492	202.0	121.5	323.5
2007	219	194108	115625	194.1	115.6	309.7
2007	220	195581	118803	195.6	118.8	314.4
2007	221	198629	129664	198.6	129.7	328.3
2007	222	199497	128589	199.5	128.6	328.1
2007	223	203038	127151	203.0	127.2	330.2
2007	224	204031	120684	204.0	120.7	324.7
2007	225	202810	121659	202.8	121.7	324.5
2007	226	200894	132174	200.9	132.2	333.1
2007	227	198731	121440	198.7	121.4	320.2
2007	228	196665	100053	196.7	100.1	296.7
2007	229	201134	112892	201.1	112.9	314.0
2007	230	196685	139291	196.7	139.3	336.0
2007	231	197435	137309	197.4	137.3	334.7
2007	232	200245	136820	200.2	136.8	337.1
2007	233	201132	140320	201.1	140.3	341.5
2007	234	200947	140699	200.9	140.7	341.6
2007	235	201118	141040	201.1	141.0	342.2
2007	236	198782	140284	198.8	140.3	339.1
2007	237	199600	139099	199.6	139.1	338.7
2007	238	199655	141282	199.7	141.3	340.9
2007	239	197601	138971	197.6	139.0	336.6
2007	240	197162	133042	197.2	133.0	330.2
2007	241	197141	136483	197.1	136.5	333.6
2007	242	197319	139595	197.3	139.6	336.9
2007	243	196472	142368	196.5	142.4	338.8

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2007	244	197315	143360	197.3	143.4	340.7
2007	245	197467	143216	197.5	143.2	340.7
2007	246	195806	140548	195.8	140.5	336.4
2007	247	195544	138957	195.5	139.0	334.5
2007	248	197176	138221	197.2	138.2	335.4
2007	249	198097	139795	198.1	139.8	337.9
2007	250	199731	134888	199.7	134.9	334.6
2007	251	199176	135866	199.2	135.9	335.0
2007	252	198331	130669	198.3	130.7	329.0
2007	253	197938	125606	197.9	125.6	323.5
2007	254	198172	129707	198.2	129.7	327.9
2007	255	199422	138056	199.4	138.1	337.5
2007	256	198099	142506	198.1	142.5	340.6
2007	257	200044	142952	200.0	143.0	343.0
2007	258	200272	141615	200.3	141.6	341.9
2007	259	200684	140472	200.7	140.5	341.2
2007	260	198146	137931	198.1	137.9	336.1
2007	261	197427	137613	197.4	137.6	335.0
2007	262	200320	136623	200.3	136.6	336.9
2007	263	200250	136923	200.3	136.9	337.2
2007	264	198153	132962	198.2	133.0	331.1
2007	265	195873	130988	195.9	131.0	326.9
2007	266	193228	126306	193.2	126.3	319.5
2007	267	198143	128335	198.1	128.3	326.5
2007	268	197916	130591	197.9	130.6	328.5
2007	269	200974	123853	201.0	123.9	324.8
2007	270	197855	133039	197.9	133.0	330.9
2007	271	196168	137231	196.2	137.2	333.4
2007	272	191984	139789	192.0	139.8	331.8
2007	273	200225	138580	200.2	138.6	338.8
2007	274	202087	133686	202.1	133.7	335.8
2007	275	202338	138187	202.3	138.2	340.5
2007	276	196089	140195	196.1	140.2	336.3
2007	277	199711	142339	199.7	142.3	342.0
2007	278	199182	142138	199.2	142.1	341.3
2007	279	200714	140000	200.7	140.0	340.7
2007	280	199616	141736	199.6	141.7	341.4
2007	281	200298	140363	200.3	140.4	340.7
2007	282	203768	140444	203.8	140.4	344.2
2007	283	201699	142493	201.7	142.5	344.2
2007	284	200872	141842	200.9	141.8	342.7
2007	285	197547	140543	197.5	140.5	338.1
2007	286	198529	140739	198.5	140.7	339.3
2007	287	199259	139732	199.3	139.7	339.0
2007	288	192290	141543	192.3	141.5	333.8
2007	289	200252	142817	200.3	142.8	343.1
2007	290	197984	144127	198.0	144.1	342.1
2007	291	182783	143413	182.8	143.4	326.2
2007	292	196288	134292	196.3	134.3	330.6
2007	293	190785	122534	190.8	122.5	313.3
2007	294	192863	121671	192.9	121.7	314.5
2007	295	191785	121458	191.8	121.5	313.2
2007	296	191501	118623	191.5	118.6	310.1
2007	297	193799	121348	193.8	121.3	315.1
2007	298	194643	123578	194.6	123.6	318.2
2007	299	195475	124966	195.5	125.0	320.4
2007	300	195444	124058	195.4	124.1	319.5
2007	301	192243	125353	192.2	125.4	317.6
2007	302	195642	123697	195.6	123.7	319.3
2007	303	200313	126897	200.3	126.9	327.2
2007	304	199898	125605	199.9	125.6	325.5
2007	305	200115	126266	200.1	126.3	326.4
2007	306	200203	127841	200.2	127.8	328.0
2007	307	198361	123709	198.4	123.7	322.1
2007	308	205873	126827	205.9	126.8	332.7
2007	309	198655	122073	198.7	122.1	320.7
2007	310	196593	124741	196.6	124.7	321.3
2007	311	197791	122274	197.8	122.3	320.1
2007	312	193844	123599	193.8	123.6	317.4
2007	313	192062	125505	192.1	125.5	317.6
2007	314	192807	129004	192.8	129.0	321.8
2007	315	198752	130622	198.8	130.6	329.4
2007	316	198189	132160	198.2	132.2	330.3
2007	317	197038	130874	197.0	130.9	327.9
2007	318	196560	128145	196.6	128.1	324.7
2007	319	194321	128493	194.3	128.5	322.8

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2007	320	194443	128509	194.4	128.5	323.0
2007	321	195559	129801	195.6	129.8	325.4
2007	322	195143	132078	195.1	132.1	327.2
2007	323	197699	129125	197.7	129.1	326.8
2007	324	196309	131894	196.3	131.9	328.2
2007	325	197884	133643	197.9	133.6	331.5
2007	326	195922	133128	195.9	133.1	329.0
2007	327	194977	129313	195.0	129.3	324.3
2007	328	194777	120815	194.8	120.8	315.6
2007	329	196736	121069	196.7	121.1	317.8
2007	330	194120	120344	194.1	120.3	314.5
2007	331	166444	124902	166.4	124.9	291.3
2007	332	188857	132896	188.9	132.9	321.8
2007	333	194205	131347	194.2	131.3	325.6
2007	334	194880	127713	194.9	127.7	322.6
2007	335	193870	130015	193.9	130.0	323.9
2007	336	193203	127992	193.2	128.0	321.2
2007	337	195690	125042	195.7	125.0	320.7
2007	338	195540	124494	195.5	124.5	320.0
2007	339	196146	127468	196.1	127.5	323.6
2007	340	196651	126784	196.7	126.8	323.4
2007	341	198423	127110	198.4	127.1	325.5
2007	342	198779	126344	198.8	126.3	325.1
2007	343	197296	124784	197.3	124.8	322.1
2007	344	195717	124069	195.7	124.1	319.8
2007	345	195138	122910	195.1	122.9	318.0
2007	346	196082	123310	196.1	123.3	319.4
2007	347	195301	125758	195.3	125.8	321.1
2007	348	195419	126096	195.4	126.1	321.5
2007	349	193243	128622	193.2	128.6	321.9
2007	350	187743	124609	187.7	124.6	312.4
2007	351	182934	122182	182.9	122.2	305.1
2007	352	190278	126241	190.3	126.2	316.5
2007	353	189401	127215	189.4	127.2	316.6
2007	354	194061	128661	194.1	128.7	322.7
2007	355	194439	126125	194.4	126.1	320.6
2007	356	191147	126779	191.1	126.8	317.9
2007	357	160638	121834	160.6	121.8	282.5
2007	358	119500	119006	119.5	119.0	238.5
2007	359	148628	116416	148.6	116.4	265.0
2007	360	184090	118515	184.1	118.5	302.6
2007	361	198632	129321	198.6	129.3	328.0
2007	362	198812	130920	198.8	130.9	329.7
2007	363	197757	127004	197.8	127.0	324.8
2007	364	195225	124306	195.2	124.3	319.5
2007	365	197930	126344	197.9	126.3	324.3
2008	1	193212	122380	193.2	122.4	315.6
2008	2	188840	124913	188.8	124.9	313.8
2008	3	190270	127319	190.3	127.3	317.6
2008	4	191524	122562	191.5	122.6	314.1
2008	5	179630	111895	179.6	111.9	291.5
2008	6	179839	111963	179.8	112.0	291.8
2008	7	187054	114979	187.1	115.0	302.0
2008	8	195765	126537	195.8	126.5	322.3
2008	9	189324	121693	189.3	121.7	311.0
2008	10	192362	122046	192.4	122.0	314.4
2008	11	196179	120540	196.2	120.5	316.7
2008	12	199438	119519	199.4	119.5	319.0
2008	13	193465	121045	193.5	121.0	314.5
2008	14	195327	121352	195.3	121.4	316.7
2008	15	191216	118417	191.2	118.4	309.6
2008	16	185685	109596	185.7	109.6	295.3
2008	17	185575	115398	185.6	115.4	301.0
2008	18	190442	128744	190.4	128.7	319.2
2008	19	190313	127238	190.3	127.2	317.6
2008	20	181511	126775	181.5	126.8	308.3
2008	21	181078	127195	181.1	127.2	308.3
2008	22	185850	125892	185.8	125.9	311.7
2008	23	188952	125328	189.0	125.3	314.3
2008	24	191801	128838	191.8	128.8	320.6
2008	25	192257	135150	192.3	135.2	327.4
2008	26	196022	135573	196.0	135.6	331.6
2008	27	194554	133153	194.6	133.2	327.7
2008	28	192334	127110	192.3	127.1	319.4
2008	29	192558	126533	192.6	126.5	319.1
2008	30	194463	131731	194.5	131.7	326.2

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2008	31	194248	124296	194.2	124.3	318.5
2008	32	196654	115198	196.7	115.2	311.9
2008	33	193541	127087	193.5	127.1	320.6
2008	34	188989	127979	189.0	128.0	317.0
2008	35	191371	128550	191.4	128.5	319.9
2008	36	192697	119513	192.7	119.5	312.2
2008	37	192018	120584	192.0	120.6	312.6
2008	38	190353	113245	190.4	113.2	303.6
2008	39	190494	131051	190.5	131.1	321.5
2008	40	192276	127807	192.3	127.8	320.1
2008	41	189213	125917	189.2	125.9	315.1
2008	42	185940	129000	185.9	129.0	314.9
2008	43	188588	132169	188.6	132.2	320.8
2008	44	188939	27070	188.9	27.1	216.0
2008	45	187652	19186	187.7	19.2	206.8
2008	46	186214	45852	186.2	45.9	232.1
2008	47	186183	64770	186.2	64.8	251.0
2008	48	186432	97172	186.4	97.2	283.6
2008	49	186207	115084	186.2	115.1	301.3
2008	50	188525	110632	188.5	110.6	299.2
2008	51	185342	115323	185.3	115.3	300.7
2008	52	185170	124845	185.2	124.8	310.0
2008	53	183831	133158	183.8	133.2	317.0
2008	54	182662	131740	182.7	131.7	314.4
2008	55	188989	134430	189.0	134.4	323.4
2008	56	195379	132603	195.4	132.6	328.0
2008	57	191182	122212	191.2	122.2	313.4
2008	58	188289	114993	188.3	115.0	303.3
2008	59	189693	113205	189.7	113.2	302.9
2008	60	193693	110344	193.7	110.3	304.0
2008	61	187145	114681	187.1	114.7	301.8
2008	62	190562	122383	190.6	122.4	312.9
2008	63	192334	126842	192.3	126.8	319.2
2008	64	194524	98169	194.5	98.2	292.7
2008	65	188556	89860	188.6	89.9	278.4
2008	66	186383	70706	186.4	70.7	257.1
2008	67	184707	66048	184.7	66.0	250.8
2008	68	185277	80008	185.3	80.0	265.3
2008	69	177400	77793	177.4	77.8	255.2
2008	70	187238	82283	187.2	82.3	269.5
2008	71	188424	81617	188.4	81.6	270.0
2008	72	188625	81845	188.6	81.8	270.5
2008	73	195625	80339	195.6	80.3	276.0
2008	74	184519	78486	184.5	78.5	263.0
2008	75	190296	78522	190.3	78.5	268.8
2008	76	187570	76344	187.6	76.3	263.9
2008	77	187052	74570	187.1	74.6	261.6
2008	78	189661	74768	189.7	74.8	264.4
2008	79	189977	75528	190.0	75.5	265.5
2008	80	184127	74405	184.1	74.4	258.5
2008	81	184857	28592	184.9	28.6	213.4
2008	82	188469	-275	188.5	-0.3	188.2
2008	83	190063	-249	190.1	-0.2	189.8
2008	84	187049	-186	187.0	-0.2	186.9
2008	85	185303	-267	185.3	-0.3	185.0
2008	86	190151	598	190.2	0.6	190.7
2008	87	182659	-2417	182.7	-2.4	180.2
2008	88	186280	-2084	186.3	-2.1	184.2
2008	89	180621	3223	180.6	3.2	183.8
2008	90	179712	6503	179.7	6.5	186.2
2008	91	182439	10167	182.4	10.2	192.6
2008	92	180447	3884	180.4	3.9	184.3
2008	93	184397	-2612	184.4	-2.6	181.8
2008	94	179663	3151	179.7	3.2	182.8
2008	95	180755	34713	180.8	34.7	215.5
2008	96	179661	44699	179.7	44.7	224.4
2008	97	179039	47049	179.0	47.0	226.1
2008	98	180290	45207	180.3	45.2	225.5
2008	99	179521	47699	179.5	47.7	227.2
2008	100	178104	39320	178.1	39.3	217.4
2008	101	178366	47535	178.4	47.5	225.9
2008	102	178386	49514	178.4	49.5	227.9
2008	103	173955	62479	174.0	62.5	236.4
2008	104	172517	69958	172.5	70.0	242.5
2008	105	173567	92747	173.6	92.7	266.3
2008	106	176616	112964	176.6	113.0	289.6

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2008	107	181601	128177	181.6	128.2	309.8
2008	108	188619	120766	188.6	120.8	309.4
2008	109	187850	108194	187.9	108.2	296.0
2008	110	185446	107043	185.4	107.0	292.5
2008	111	184924	106543	184.9	106.5	291.5
2008	112	184317	106047	184.3	106.0	290.4
2008	113	178201	106042	178.2	106.0	284.2
2008	114	170502	106056	170.5	106.1	276.6
2008	115	167622	106037	167.6	106.0	273.7
2008	116	156260	107434	156.3	107.4	263.7
2008	117	174306	111576	174.3	111.6	285.9
2008	118	178374	113374	178.4	113.4	291.7
2008	119	178707	117990	178.7	118.0	296.7
2008	120	181608	123149	181.6	123.1	304.8
2008	121	180511	127604	180.5	127.6	308.1
2008	122	181053	129559	181.1	129.6	310.6
2008	123	181103	123971	181.1	124.0	305.1
2008	124	180069	125468	180.1	125.5	305.5
2008	125	180736	123947	180.7	123.9	304.7
2008	126	179948	121182	179.9	121.2	301.1
2008	127	178676	116433	178.7	116.4	295.1
2008	128	179496	111163	179.5	111.2	290.7
2008	129	181412	103933	181.4	103.9	285.3
2008	130	179406	113194	179.4	113.2	292.6
2008	131	181580	126267	181.6	126.3	307.8
2008	132	179657	127541	179.7	127.5	307.2
2008	133	181469	122749	181.5	122.7	304.2
2008	134	186191	115791	186.2	115.8	302.0
2008	135	175512	116590	175.5	116.6	292.1
2008	136	71745	112959	71.7	113.0	184.7
2008	137	4687	130403	4.7	130.4	135.1
2008	138	5244	130678	5.2	130.7	135.9
2008	139	605	111916	0.6	111.9	112.5
2008	140	377	112454	0.4	112.5	112.8
2008	141	824	113931	0.8	113.9	114.8
2008	142	1028	130124	1.0	130.1	131.2
2008	143	17746	139701	17.7	139.7	157.4
2008	144	21998	140884	22.0	140.9	162.9
2008	145	22419	139607	22.4	139.6	162.0
2008	146	22581	136130	22.6	136.1	158.7
2008	147	23331	127267	23.3	127.3	150.6
2008	148	22192	112450	22.2	112.4	134.6
2008	149	18494	119735	18.5	119.7	138.2
2008	150	20703	128159	20.7	128.2	148.9
2008	151	20808	124630	20.8	124.6	145.4
2008	152	19493	122370	19.5	122.4	141.9
2008	153	25562	117298	25.6	117.3	142.9
2008	154	32526	127077	32.5	127.1	159.6
2008	155	58541	108603	58.5	108.6	167.1
2008	156	102051	104857	102.1	104.9	206.9
2008	157	161298	106948	161.3	106.9	268.2
2008	158	188109	108386	188.1	108.4	296.5
2008	159	197102	111175	197.1	111.2	308.3
2008	160	196709	101745	196.7	101.7	298.5
2008	161	194881	109242	194.9	109.2	304.1
2008	162	191722	111430	191.7	111.4	303.2
2008	163	191863	115046	191.9	115.0	306.9
2008	164	189567	125661	189.6	125.7	315.2
2008	165	183939	123073	183.9	123.1	307.0
2008	166	171530	118176	171.5	118.2	289.7
2008	167	175456	111093	175.5	111.1	286.5
2008	168	173831	118850	173.8	118.8	292.7
2008	169	176853	125335	176.9	125.3	302.2
2008	170	176919	129417	176.9	129.4	306.3
2008	171	175269	127891	175.3	127.9	303.2
2008	172	176070	125089	176.1	125.1	301.2
2008	173	177539	119410	177.5	119.4	296.9
2008	174	173662	117250	173.7	117.2	290.9
2008	175	175893	110548	175.9	110.5	286.4
2008	176	173426	112896	173.4	112.9	286.3
2008	177	172468	120327	172.5	120.3	292.8
2008	178	178791	125254	178.8	125.3	304.0
2008	179	182983	125022	183.0	125.0	308.0
2008	180	188330	116284	188.3	116.3	304.6
2008	181	189830	112019	189.8	112.0	301.8
2008	182	191276	117514	191.3	117.5	308.8

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2008	183	192215	124923	192.2	124.9	317.1
2008	184	190587	131058	190.6	131.1	321.6
2008	185	190486	127729	190.5	127.7	318.2
2008	186	191312	126553	191.3	126.6	317.9
2008	187	191255	127706	191.3	127.7	319.0
2008	188	190322	134103	190.3	134.1	324.4
2008	189	191836	131086	191.8	131.1	322.9
2008	190	191167	96965	191.2	97.0	288.1
2008	191	188287	88204	188.3	88.2	276.5
2008	192	191705	87844	191.7	87.8	279.5
2008	193	191542	98743	191.5	98.7	290.3
2008	194	191893	113374	191.9	113.4	305.3
2008	195	190874	106455	190.9	106.5	297.3
2008	196	190663	107069	190.7	107.1	297.7
2008	197	191970	110013	192.0	110.0	302.0
2008	198	190264	114159	190.3	114.2	304.4
2008	199	190946	124006	190.9	124.0	315.0
2008	200	188548	124204	188.5	124.2	312.8
2008	201	189101	126031	189.1	126.0	315.1
2008	202	187541	117953	187.5	118.0	305.5
2008	203	180715	115121	180.7	115.1	295.8
2008	204	180740	111383	180.7	111.4	292.1
2008	205	180726	102745	180.7	102.7	283.5
2008	206	179871	103892	179.9	103.9	283.8
2008	207	179275	105610	179.3	105.6	284.9
2008	208	177165	106115	177.2	106.1	283.3
2008	209	169105	110078	169.1	110.1	279.2
2008	210	165951	112044	166.0	112.0	278.0
2008	211	164240	114663	164.2	114.7	278.9
2008	212	164899	111514	164.9	111.5	276.4
2008	213	174407	106479	174.4	106.5	280.9
2008	214	177955	107505	178.0	107.5	285.5
2008	215	178470	110306	178.5	110.3	288.8
2008	216	167187	113219	167.2	113.2	280.4
2008	217	177634	114110	177.6	114.1	291.7
2008	218	183165	115377	183.2	115.4	298.5
2008	219	185069	114699	185.1	114.7	299.8
2008	220	187240	114084	187.2	114.1	301.3
2008	221	189546	114895	189.5	114.9	304.4
2008	222	190555	114966	190.6	115.0	305.5
2008	223	190144	114944	190.1	114.9	305.1
2008	224	191362	114953	191.4	115.0	306.3
2008	225	189542	114709	189.5	114.7	304.3
2008	226	189855	113426	189.9	113.4	303.3
2008	227	190593	111666	190.6	111.7	302.3
2008	228	189759	112048	189.8	112.0	301.8
2008	229	190619	114472	190.6	114.5	305.1
2008	230	189984	115013	190.0	115.0	305.0
2008	231	190860	114983	190.9	115.0	305.8
2008	232	191161	114719	191.2	114.7	305.9
2008	233	190179	114767	190.2	114.8	304.9
2008	234	188927	114589	188.9	114.6	303.5
2008	235	189672	114349	189.7	114.3	304.0
2008	236	189580	114113	189.6	114.1	303.7
2008	237	190933	114932	190.9	114.9	305.9
2008	238	189085	114335	189.1	114.3	303.4
2008	239	188537	114705	188.5	114.7	303.2
2008	240	189094	115004	189.1	115.0	304.1
2008	241	191988	114296	192.0	114.3	306.3
2008	242	190759	114029	190.8	114.0	304.8
2008	243	187912	112262	187.9	112.3	300.2
2008	244	187296	114833	187.3	114.8	302.1
2008	245	189023	114861	189.0	114.9	303.9
2008	246	185405	114519	185.4	114.5	299.9
2008	247	185290	115928	185.3	115.9	301.2
2008	248	185455	112995	185.5	113.0	298.4
2008	249	186048	111232	186.0	111.2	297.3
2008	250	185631	107720	185.6	107.7	293.4
2008	251	186909	122962	186.9	123.0	309.9
2008	252	184654	122507	184.7	122.5	307.2
2008	253	185167	124838	185.2	124.8	310.0
2008	254	185960	124799	186.0	124.8	310.8
2008	255	184478	124371	184.5	124.4	308.8
2008	256	184589	114874	184.6	114.9	299.5
2008	257	185319	115028	185.3	115.0	300.3
2008	258	184386	113234	184.4	113.2	297.6

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2008	259	185369	114465	185.4	114.5	299.8
2008	260	184930	115559	184.9	115.6	300.5
2008	261	185669	115790	185.7	115.8	301.5
2008	262	186524	114969	186.5	115.0	301.5
2008	263	178760	103507	178.8	103.5	282.3
2008	264	164919	85020	164.9	85.0	249.9
2008	265	154988	85024	155.0	85.0	240.0
2008	266	150427	96680	150.4	96.7	247.1
2008	267	158423	115594	158.4	115.6	274.0
2008	268	182751	115475	182.8	115.5	298.2
2008	269	183838	112613	183.8	112.6	296.5
2008	270	183654	95518	183.7	95.5	279.2
2008	271	180832	95295	180.8	95.3	276.1
2008	272	178351	102519	178.4	102.5	280.9
2008	273	176913	105443	176.9	105.4	282.4
2008	274	178159	117596	178.2	117.6	295.8
2008	275	156700	124289	156.7	124.3	281.0
2008	276	157454	125321	157.5	125.3	282.8
2008	277	190515	118916	190.5	118.9	309.4
2008	278	194272	115412	194.3	115.4	309.7
2008	279	195430	110141	195.4	110.1	305.6
2008	280	197074	113684	197.1	113.7	310.8
2008	281	194194	124437	194.2	124.4	318.6
2008	282	191286	130690	191.3	130.7	322.0
2008	283	194438	131970	194.4	132.0	326.4
2008	284	187056	132035	187.1	132.0	319.1
2008	285	182950	130652	182.9	130.7	313.6
2008	286	170658	131050	170.7	131.0	301.7
2008	287	171930	131928	171.9	131.9	303.9
2008	288	171743	129786	171.7	129.8	301.5
2008	289	166635	123993	166.6	124.0	290.6
2008	290	163339	119549	163.3	119.5	282.9
2008	291	167431	124365	167.4	124.4	291.8
2008	292	169885	123136	169.9	123.1	293.0
2008	293	171480	124201	171.5	124.2	295.7
2008	294	171405	115012	171.4	115.0	286.4
2008	295	169235	128188	169.2	128.2	297.4
2008	296	168557	128161	168.6	128.2	296.7
2008	297	168939	128616	168.9	128.6	297.6
2008	298	173107	126779	173.1	126.8	299.9
2008	299	173698	132324	173.7	132.3	306.0
2008	300	175269	135329	175.3	135.3	310.6
2008	301	181684	134847	181.7	134.8	316.5
2008	302	183940	97840	183.9	97.8	281.8
2008	303	190317	109315	190.3	109.3	299.6
2008	304	179175	119482	179.2	119.5	298.7
2008	305	183751	118983	183.8	119.0	302.7
2008	306	171132	114677	171.1	114.7	285.8
2008	307	164417	115009	164.4	115.0	279.4
2008	308	163998	109393	164.0	109.4	273.4
2008	309	161177	107710	161.2	107.7	268.9
2008	310	165879	109082	165.9	109.1	275.0
2008	311	156757	102926	156.8	102.9	259.7
2008	312	163913	88469	163.9	88.5	252.4
2008	313	167670	95563	167.7	95.6	263.2
2008	314	177697	98859	177.7	98.9	276.6
2008	315	178725	90704	178.7	90.7	269.4
2008	316	171146	94106	171.1	94.1	265.3
2008	317	177992	89978	178.0	90.0	268.0
2008	318	184539	84233	184.5	84.2	268.8
2008	319	190830	85679	190.8	85.7	276.5
2008	320	188283	102573	188.3	102.6	290.9
2008	321	189223	100464	189.2	100.5	289.7
2008	322	186738	94198	186.7	94.2	280.9
2008	323	184913	88599	184.9	88.6	273.5
2008	324	179616	98920	179.6	98.9	278.5
2008	325	180846	103992	180.8	104.0	284.8
2008	326	184151	110396	184.2	110.4	294.5
2008	327	175218	114765	175.2	114.8	290.0
2008	328	168322	119344	168.3	119.3	287.7
2008	329	178155	126045	178.2	126.0	304.2
2008	330	181886	130082	181.9	130.1	312.0
2008	331	183494	131867	183.5	131.9	315.4
2008	332	187142	126337	187.1	126.3	313.5
2008	333	178341	120610	178.3	120.6	299.0
2008	334	174365	125953	174.4	126.0	300.3

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2008	335	180212	125707	180.2	125.7	305.9
2008	336	183074	125155	183.1	125.2	308.2
2008	337	182747	125849	182.7	125.8	308.6
2008	338	182199	122177	182.2	122.2	304.4
2008	339	184294	122090	184.3	122.1	306.4
2008	340	188704	122768	188.7	122.8	311.5
2008	341	190131	113347	190.1	113.3	303.5
2008	342	188756	113799	188.8	113.8	302.6
2008	343	182171	118691	182.2	118.7	300.9
2008	344	180296	120656	180.3	120.7	301.0
2008	345	171895	111182	171.9	111.2	283.1
2008	346	174477	114300	174.5	114.3	288.8
2008	347	179786	120702	179.8	120.7	300.5
2008	348	195865	124213	195.9	124.2	320.1
2008	349	188331	126038	188.3	126.0	314.4
2008	350	173209	115772	173.2	115.8	289.0
2008	351	173108	109182	173.1	109.2	282.3
2008	352	184286	108285	184.3	108.3	292.6
2008	353	172736	117722	172.7	117.7	290.5
2008	354	179585	107462	179.6	107.5	287.0
2008	355	175764	100804	175.8	100.8	276.6
2008	356	170627	109411	170.6	109.4	280.0
2008	357	170230	108858	170.2	108.9	279.1
2008	358	169032	102878	169.0	102.9	271.9
2008	359	161443	92841	161.4	92.8	254.3
2008	360	161798	92805	161.8	92.8	254.6
2008	361	165962	92936	166.0	92.9	258.9
2008	362	158977	90695	159.0	90.7	249.7
2008	363	156301	90731	156.3	90.7	247.0
2008	364	166913	99485	166.9	99.5	266.4
2008	365	174904	115690	174.9	115.7	290.6
2008	366	174934	119115	174.9	119.1	294.0
2009	1	174552	117898	174.6	117.9	292.5
2009	2	171360	112142	171.4	112.1	283.5
2009	3	164957	103844	165.0	103.8	268.8
2009	4	164253	100032	164.3	100.0	264.3
2009	5	164093	100166	164.1	100.2	264.3
2009	6	166324	99287	166.3	99.3	265.6
2009	7	166111	99298	166.1	99.3	265.4
2009	8	163490	98764	163.5	98.8	262.3
2009	9	161398	103236	161.4	103.2	264.6
2009	10	160948	106581	160.9	106.6	267.5
2009	11	160699	90531	160.7	90.5	251.2
2009	12	161209	89724	161.2	89.7	250.9
2009	13	161712	91003	161.7	91.0	252.7
2009	14	161380	95578	161.4	95.6	257.0
2009	15	166392	99845	166.4	99.8	266.2
2009	16	165337	100028	165.3	100.0	265.4
2009	17	165406	100874	165.4	100.9	266.3
2009	18	165933	93402	165.9	93.4	259.3
2009	19	165813	90132	165.8	90.1	255.9
2009	20	166174	99690	166.2	99.7	265.9
2009	21	166020	99950	166.0	100.0	266.0
2009	22	166474	102924	166.5	102.9	269.4
2009	23	166448	110159	166.4	110.2	276.6
2009	24	171681	108515	171.7	108.5	280.2
2009	25	174812	106384	174.8	106.4	281.2
2009	26	176272	109663	176.3	109.7	285.9
2009	27	175631	109818	175.6	109.8	285.4
2009	28	175282	110019	175.3	110.0	285.3
2009	29	175270	109664	175.3	109.7	284.9
2009	30	170954	98897	171.0	98.9	269.9
2009	31	163985	98381	164.0	98.4	262.4
2009	32	166363	98353	166.4	98.4	264.7
2009	33	166214	99256	166.2	99.3	265.5
2009	34	166487	109333	166.5	109.3	275.8
2009	35	169156	109972	169.2	110.0	279.1
2009	36	169983	110013	170.0	110.0	280.0
2009	37	171261	109963	171.3	110.0	281.2
2009	38	170476	101558	170.5	101.6	272.0
2009	39	169504	102110	169.5	102.1	271.6
2009	40	168371	102081	168.4	102.1	270.5
2009	41	170896	101986	170.9	102.0	272.9
2009	42	170552	101090	170.6	101.1	271.6
2009	43	169893	98391	169.9	98.4	268.3
2009	44	168239	97821	168.2	97.8	266.1

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2009	45	169061	87600	169.1	87.6	256.7
2009	46	168059	86353	168.1	86.4	254.4
2009	47	165750	85725	165.8	85.7	251.5
2009	48	162582	83568	162.6	83.6	246.1
2009	49	167034	88332	167.0	88.3	255.4
2009	50	164643	92031	164.6	92.0	256.7
2009	51	154716	96307	154.7	96.3	251.0
2009	52	158651	90763	158.7	90.8	249.4
2009	53	157473	92182	157.5	92.2	249.7
2009	54	156977	88860	157.0	88.9	245.8
2009	55	149944	87350	149.9	87.4	237.3
2009	56	152175	86159	152.2	86.2	238.3
2009	57	151345	86284	151.3	86.3	237.6
2009	58	149197	87007	149.2	87.0	236.2
2009	59	149697	87036	149.7	87.0	236.7
2009	60	152275	87421	152.3	87.4	239.7
2009	61	149874	87482	149.9	87.5	237.4
2009	62	160782	89296	160.8	89.3	250.1
2009	63	160523	91136	160.5	91.1	251.7
2009	64	158069	90038	158.1	90.0	248.1
2009	65	152958	91317	153.0	91.3	244.3
2009	66	149964	94626	150.0	94.6	244.6
2009	67	146020	92024	146.0	92.0	238.0
2009	68	161964	92312	162.0	92.3	254.3
2009	69	166405	92527	166.4	92.5	258.9
2009	70	169615	94348	169.6	94.3	264.0
2009	71	171365	93464	171.4	93.5	264.8
2009	72	172567	105179	172.6	105.2	277.7
2009	73	167271	100370	167.3	100.4	267.6
2009	74	163216	100046	163.2	100.0	263.3
2009	75	162838	101058	162.8	101.1	263.9
2009	76	163872	95320	163.9	95.3	259.2
2009	77	168692	94874	168.7	94.9	263.6
2009	78	174561	96434	174.6	96.4	271.0
2009	79	173527	99266	173.5	99.3	272.8
2009	80	171617	100052	171.6	100.1	271.7
2009	81	163102	103429	163.1	103.4	266.5
2009	82	167476	105563	167.5	105.6	273.0
2009	83	162130	107626	162.1	107.6	269.8
2009	84	154874	107986	154.9	108.0	262.9
2009	85	153077	109333	153.1	109.3	262.4
2009	86	153060	109469	153.1	109.5	262.5
2009	87	145168	108841	145.2	108.8	254.0
2009	88	141711	107880	141.7	107.9	249.6
2009	89	150437	99777	150.4	99.8	250.2
2009	90	151465	99790	151.5	99.8	251.3
2009	91	151267	109708	151.3	109.7	261.0
2009	92	149480	110680	149.5	110.7	260.2
2009	93	149363	110808	149.4	110.8	260.2
2009	94	150797	111412	150.8	111.4	262.2
2009	95	152557	111939	152.6	111.9	264.5
2009	96	149262	111835	149.3	111.8	261.1
2009	97	148610	112475	148.6	112.5	261.1
2009	98	149923	117157	149.9	117.2	267.1
2009	99	146802	116353	146.8	116.4	263.2
2009	100	145615	112258	145.6	112.3	257.9
2009	101	148421	122796	148.4	122.8	271.2
2009	102	153322	130353	153.3	130.4	283.7
2009	103	143764	134390	143.8	134.4	278.2
2009	104	163857	132291	163.9	132.3	296.1
2009	105	159393	129727	159.4	129.7	289.1
2009	106	165373	130588	165.4	130.6	296.0
2009	107	166172	122388	166.2	122.4	288.6
2009	108	170793	120752	170.8	120.8	291.5
2009	109	171580	109935	171.6	109.9	281.5
2009	110	170367	77318	170.4	77.3	247.7
2009	111	170957	62865	171.0	62.9	233.8
2009	112	172469	61509	172.5	61.5	234.0
2009	113	178923	63835	178.9	63.8	242.8
2009	114	165573	63555	165.6	63.6	229.1
2009	115	178937	63191	178.9	63.2	242.1
2009	116	177474	62943	177.5	62.9	240.4
2009	117	178914	60691	178.9	60.7	239.6
2009	118	179153	57874	179.2	57.9	237.0
2009	119	178606	59053	178.6	59.1	237.7
2009	120	180102	59277	180.1	59.3	239.4

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Refinery Daily Average Crude Throughput

Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2009	121	180139	59524	180.1	59.5	239.7
2009	122	179719	57656	179.7	57.7	237.4
2009	123	180127	65648	180.1	65.6	245.8
2009	124	181059	62186	181.1	62.2	243.2
2009	125	179733	69735	179.7	69.7	249.5
2009	126	181099	64916	181.1	64.9	246.0
2009	127	179605	66577	179.6	66.6	246.2
2009	128	173569	69486	173.6	69.5	243.1
2009	129	171535	63894	171.5	63.9	235.4
2009	130	175196	62606	175.2	62.6	237.8
2009	131	177864	63283	177.9	63.3	241.1
2009	132	174831	63573	174.8	63.6	238.4
2009	133	179219	60376	179.2	60.4	239.6
2009	134	182741	64916	182.7	64.9	247.7
2009	135	181246	66632	181.2	66.6	247.9
2009	136	179933	65663	179.9	65.7	245.6
2009	137	181141	64029	181.1	64.0	245.2
2009	138	178484	65635	178.5	65.6	244.1
2009	139	178643	65249	178.6	65.2	243.9
2009	140	180219	67768	180.2	67.8	248.0
2009	141	181305	71381	181.3	71.4	252.7
2009	142	177257	71481	177.3	71.5	248.7
2009	143	179852	71686	179.9	71.7	251.5
2009	144	177559	70257	177.6	70.3	247.8
2009	145	174907	67206	174.9	67.2	242.1
2009	146	161192	67540	161.2	67.5	228.7
2009	147	146637	69269	146.6	69.3	215.9
2009	148	174226	76540	174.2	76.5	250.8
2009	149	179985	88509	180.0	88.5	268.5
2009	150	181062	105303	181.1	105.3	286.4
2009	151	181235	109177	181.2	109.2	290.4
2009	152	181413	100306	181.4	100.3	281.7
2009	153	180974	88328	181.0	88.3	269.3
2009	154	180525	91467	180.5	91.5	272.0
2009	155	152011	99454	152.0	99.5	251.5
2009	156	126852	97949	126.9	97.9	224.8
2009	157	135951	84701	136.0	84.7	220.7
2009	158	130687	95513	130.7	95.5	226.2
2009	159	133230	94474	133.2	94.5	227.7
2009	160	138533	92214	138.5	92.2	230.7
2009	161	140051	91236	140.1	91.2	231.3
2009	162	140128	92416	140.1	92.4	232.5
2009	163	141625	96659	141.6	96.7	238.3
2009	164	144201	106315	144.2	106.3	250.5
2009	165	161070	114570	161.1	114.6	275.6
2009	166	166691	116495	166.7	116.5	283.2
2009	167	170427	112565	170.4	112.6	283.0
2009	168	163111	108931	163.1	108.9	272.0
2009	169	169485	106324	169.5	106.3	275.8
2009	170	170409	107862	170.4	107.9	278.3
2009	171	169301	112820	169.3	112.8	282.1
2009	172	168333	112975	168.3	113.0	281.3
2009	173	169341	112869	169.3	112.9	282.2
2009	174	165922	111826	165.9	111.8	277.7
2009	175	168753	109917	168.8	109.9	278.7
2009	176	171746	100713	171.7	100.7	272.5
2009	177	181406	97139	181.4	97.1	278.5
2009	178	182574	108442	182.6	108.4	291.0
2009	179	181326	111516	181.3	111.5	292.8
2009	180	181793	101331	181.8	101.3	283.1
2009	181	181255	85503	181.3	85.5	266.8
2009	182	166364	101785	166.4	101.8	268.1
2009	183	151179	99213	151.2	99.2	250.4
2009	184	150736	93829	150.7	93.8	244.6
2009	185	150429	96510	150.4	96.5	246.9
2009	186	150859	99281	150.9	99.3	250.1
2009	187	158266	102678	158.3	102.7	260.9
2009	188	165420	104821	165.4	104.8	270.2
2009	189	166698	104990	166.7	105.0	271.7
2009	190	165161	105072	165.2	105.1	270.2
2009	191	164689	104045	164.7	104.0	268.7
2009	192	165844	98249	165.8	98.2	264.1
2009	193	164639	99649	164.6	99.6	264.3
2009	194	169037	101962	169.0	102.0	271.0
2009	195	180454	103553	180.5	103.6	284.0
2009	196	181345	102799	181.3	102.8	284.1

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Refinery Daily Average Crude Throughput

Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2009	197	182140	105953	182.1	106.0	288.1
2009	198	184820	111161	184.8	111.2	296.0
2009	199	187293	115362	187.3	115.4	302.7
2009	200	188118	117557	188.1	117.6	305.7
2009	201	184650	115922	184.7	115.9	300.6
2009	202	190203	113851	190.2	113.9	304.1
2009	203	192071	111425	192.1	111.4	303.5
2009	204	192830	104135	192.8	104.1	297.0
2009	205	171389	111993	171.4	112.0	283.4
2009	206	168470	112407	168.5	112.4	280.9
2009	207	173432	110993	173.4	111.0	284.4
2009	208	181106	114516	181.1	114.5	295.6
2009	209	185070	107377	185.1	107.4	292.4
2009	210	183130	107862	183.1	107.9	291.0
2009	211	182777	108017	182.8	108.0	290.8
2009	212	180432	104037	180.4	104.0	284.5
2009	213	160546	109772	160.5	109.8	270.3
2009	214	153320	113739	153.3	113.7	267.1
2009	215	160665	112779	160.7	112.8	273.4
2009	216	181441	106109	181.4	106.1	287.5
2009	217	181830	103963	181.8	104.0	285.8
2009	218	169524	110535	169.5	110.5	280.1
2009	219	126554	95646	126.6	95.6	222.2
2009	220	113345	94989	113.3	95.0	208.3
2009	221	109793	93965	109.8	94.0	203.8
2009	222	108617	94486	108.6	94.5	203.1
2009	223	107875	95005	107.9	95.0	202.9
2009	224	104632	95341	104.6	95.3	200.0
2009	225	103612	94378	103.6	94.4	198.0
2009	226	108759	96006	108.8	96.0	204.8
2009	227	110117	96326	110.1	96.3	206.4
2009	228	110592	96202	110.6	96.2	206.8
2009	229	111211	95819	111.2	95.8	207.0
2009	230	111083	95065	111.1	95.1	206.1
2009	231	111616	95108	111.6	95.1	206.7
2009	232	115411	95251	115.4	95.3	210.7
2009	233	130447	95698	130.4	95.7	226.1
2009	234	130296	94843	130.3	94.8	225.1
2009	235	130050	94981	130.0	95.0	225.0
2009	236	132125	95154	132.1	95.2	227.3
2009	237	129926	95745	129.9	95.7	225.7
2009	238	132934	95997	132.9	96.0	228.9
2009	239	133766	95548	133.8	95.5	229.3
2009	240	131171	94907	131.2	94.9	226.1
2009	241	133629	95985	133.6	96.0	229.6
2009	242	135177	96295	135.2	96.3	231.5
2009	243	132854	96534	132.9	96.5	229.4
2009	244	132773	94996	132.8	95.0	227.8
2009	245	132236	94992	132.2	95.0	227.2
2009	246	130283	94976	130.3	95.0	225.3
2009	247	131137	94981	131.1	95.0	226.1
2009	248	131968	95006	132.0	95.0	227.0
2009	249	133659	94995	133.7	95.0	228.7
2009	250	131708	95057	131.7	95.1	226.8
2009	251	132815	95715	132.8	95.7	228.5
2009	252	132302	94216	132.3	94.2	226.5
2009	253	139483	97092	139.5	97.1	236.6
2009	254	150505	104208	150.5	104.2	254.7
2009	255	150355	106750	150.4	106.8	257.1
2009	256	150196	106843	150.2	106.8	257.0
2009	257	149999	106452	150.0	106.5	256.5
2009	258	160042	106969	160.0	107.0	267.0
2009	259	155692	109388	155.7	109.4	265.1
2009	260	167790	109957	167.8	110.0	277.7
2009	261	179055	109204	179.1	109.2	288.3
2009	262	175817	109832	175.8	109.8	285.6
2009	263	169247	109933	169.2	109.9	279.2
2009	264	169653	109791	169.7	109.8	279.4
2009	265	176819	110091	176.8	110.1	286.9
2009	266	182314	108768	182.3	108.8	291.1
2009	267	182930	105872	182.9	105.9	288.8
2009	268	183972	105822	184.0	105.8	289.8
2009	269	182680	106177	182.7	106.2	288.9
2009	270	185189	110074	185.2	110.1	295.3
2009	271	184461	110458	184.5	110.5	294.9
2009	272	184133	109895	184.1	109.9	294.0

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2009	273	185106	104456	185.1	104.5	289.6
2009	274	183535	109575	183.5	109.6	293.1
2009	275	182288	110098	182.3	110.1	292.4
2009	276	184877	109832	184.9	109.8	294.7
2009	277	183814	109823	183.8	109.8	293.6
2009	278	184162	109687	184.2	109.7	293.8
2009	279	180266	109589	180.3	109.6	289.9
2009	280	180512	108910	180.5	108.9	289.4
2009	281	180652	109683	180.7	109.7	290.3
2009	282	180164	109783	180.2	109.8	289.9
2009	283	179978	109762	180.0	109.8	289.7
2009	284	180764	109872	180.8	109.9	290.6
2009	285	181449	109776	181.4	109.8	291.2
2009	286	181333	108736	181.3	108.7	290.1
2009	287	179968	109788	180.0	109.8	289.8
2009	288	181556	109791	181.6	109.8	291.3
2009	289	177105	109683	177.1	109.7	286.8
2009	290	181814	109590	181.8	109.6	291.4
2009	291	181633	109938	181.6	109.9	291.6
2009	292	180442	110040	180.4	110.0	290.5
2009	293	178736	110201	178.7	110.2	288.9
2009	294	179335	109591	179.3	109.6	288.9
2009	295	177178	108822	177.2	108.8	286.0
2009	296	177934	109620	177.9	109.6	287.6
2009	297	176890	109571	176.9	109.6	286.5
2009	298	181209	110032	181.2	110.0	291.2
2009	299	180385	109989	180.4	110.0	290.4
2009	300	181442	109825	181.4	109.8	291.3
2009	301	178398	107238	178.4	107.2	285.6
2009	302	175022	105193	175.0	105.2	280.2
2009	303	174992	105052	175.0	105.1	280.0
2009	304	174822	104924	174.8	104.9	279.7
2009	305	182096	109406	182.1	109.4	291.5
2009	306	176577	105032	176.6	105.0	281.6
2009	307	170583	105022	170.6	105.0	275.6
2009	308	170635	105013	170.6	105.0	275.6
2009	309	174995	105521	175.0	105.5	280.5
2009	310	183816	111373	183.8	111.4	295.2
2009	311	182407	113054	182.4	113.1	295.5
2009	312	181302	112693	181.3	112.7	294.0
2009	313	184960	114480	185.0	114.5	299.4
2009	314	174881	111410	174.9	111.4	286.3
2009	315	183643	109591	183.6	109.6	293.2
2009	316	185181	111749	185.2	111.7	296.9
2009	317	182168	114719	182.2	114.7	296.9
2009	318	182463	114933	182.5	114.9	297.4
2009	319	178133	114883	178.1	114.9	293.0
2009	320	180435	114189	180.4	114.2	294.6
2009	321	180824	110611	180.8	110.6	291.4
2009	322	182047	110103	182.0	110.1	292.1
2009	323	183412	110719	183.4	110.7	294.1
2009	324	183546	112365	183.5	112.4	295.9
2009	325	187236	111931	187.2	111.9	299.2
2009	326	186458	115057	186.5	115.1	301.5
2009	327	175987	118673	176.0	118.7	294.7
2009	328	174589	118651	174.6	118.7	293.2
2009	329	181487	89775	181.5	89.8	271.3
2009	330	178113	87980	178.1	88.0	266.1
2009	331	177473	87995	177.5	88.0	265.5
2009	332	178415	86682	178.4	86.7	265.1
2009	333	178909	84614	178.9	84.6	263.5
2009	334	175870	82300	175.9	82.3	258.2
2009	335	173850	83329	173.9	83.3	257.2
2009	336	170822	85413	170.8	85.4	256.2
2009	337	169539	98636	169.5	98.6	268.2
2009	338	167685	110431	167.7	110.4	278.1
2009	339	171608	116684	171.6	116.7	288.3
2009	340	173104	119183	173.1	119.2	292.3
2009	341	180603	123110	180.6	123.1	303.7
2009	342	183779	129260	183.8	129.3	313.0
2009	343	182803	131222	182.8	131.2	314.0
2009	344	180188	133045	180.2	133.0	313.2
2009	345	177109	132660	177.1	132.7	309.8
2009	346	178003	133682	178.0	133.7	311.7
2009	347	177185	134255	177.2	134.3	311.4
2009	348	172175	132255	172.2	132.3	304.4

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2009	349	173821	131075	173.8	131.1	304.9
2009	350	175515	132677	175.5	132.7	308.2
2009	351	180281	132444	180.3	132.4	312.7
2009	352	179788	132245	179.8	132.2	312.0
2009	353	179644	132218	179.6	132.2	311.9
2009	354	176337	131290	176.3	131.3	307.6
2009	355	177213	127958	177.2	128.0	305.2
2009	356	172955	127117	173.0	127.1	300.1
2009	357	180079	123449	180.1	123.4	303.5
2009	358	176349	118423	176.3	118.4	294.8
2009	359	180126	118991	180.1	119.0	299.1
2009	360	180526	119012	180.5	119.0	299.5
2009	361	180967	122925	181.0	122.9	303.9
2009	362	183158	128193	183.2	128.2	311.4
2009	363	169451	129747	169.5	129.7	299.2
2009	364	161762	130979	161.8	131.0	292.7
2009	365	161811	136123	161.8	136.1	297.9
2010	1	162650	135186	162.7	135.2	297.8
2010	2	172679	133897	172.7	133.9	306.6
2010	3	179990	135001	180.0	135.0	315.0
2010	4	182085	127132	182.1	127.1	309.2
2010	5	178658	121611	178.7	121.6	300.3
2010	6	183786	112793	183.8	112.8	296.6
2010	7	185858	113441	185.9	113.4	299.3
2010	8	183658	122634	183.7	122.6	306.3
2010	9	177380	122333	177.4	122.3	299.7
2010	10	176448	125313	176.4	125.3	301.8
2010	11	177530	128845	177.5	128.8	306.4
2010	12	174028	125981	174.0	126.0	300.0
2010	13	172643	119573	172.6	119.6	292.2
2010	14	171118	125905	171.1	125.9	297.0
2010	15	176801	127788	176.8	127.8	304.6
2010	16	183327	128563	183.3	128.6	311.9
2010	17	184214	129958	184.2	130.0	314.2
2010	18	183442	132802	183.4	132.8	316.2
2010	19	185970	131772	186.0	131.8	317.7
2010	20	185791	132868	185.8	132.9	318.7
2010	21	185464	132403	185.5	132.4	317.9
2010	22	183111	132100	183.1	132.1	315.2
2010	23	181344	130545	181.3	130.5	311.9
2010	24	180351	130088	180.4	130.1	310.4
2010	25	179266	128899	179.3	128.9	308.2
2010	26	180771	130878	180.8	130.9	311.6
2010	27	183799	131963	183.8	132.0	315.8
2010	28	186264	134251	186.3	134.3	320.5
2010	29	185102	134064	185.1	134.1	319.2
2010	30	188120	134861	188.1	134.9	323.0
2010	31	190029	133449	190.0	133.4	323.5
2010	32	185566	120789	185.6	120.8	306.4
2010	33	184941	125963	184.9	126.0	310.9
2010	34	186901	127367	186.9	127.4	314.3
2010	35	190551	130742	190.6	130.7	321.3
2010	36	188299	128583	188.3	128.6	316.9
2010	37	178158	125481	178.2	125.5	303.6
2010	38	177402	122864	177.4	122.9	300.3
2010	39	171602	124198	171.6	124.2	295.8
2010	40	168711	126047	168.7	126.0	294.8
2010	41	153325	123548	153.3	123.5	276.9
2010	42	163546	121210	163.5	121.2	284.8
2010	43	168307	122850	168.3	122.9	291.2
2010	44	171989	126699	172.0	126.7	298.7
2010	45	172126	119223	172.1	119.2	291.3
2010	46	173158	115283	173.2	115.3	288.4
2010	47	181835	113294	181.8	113.3	295.1
2010	48	178953	115472	179.0	115.5	294.4
2010	49	180388	120664	180.4	120.7	301.1
2010	50	181550	119856	181.5	119.9	301.4
2010	51	185066	117661	185.1	117.7	302.7
2010	52	184443	117490	184.4	117.5	301.9
2010	53	178537	118924	178.5	118.9	297.5
2010	54	172066	122104	172.1	122.1	294.2
2010	55	172059	128265	172.1	128.3	300.3
2010	56	172831	129202	172.8	129.2	302.0
2010	57	171098	127651	171.1	127.7	298.7
2010	58	169980	128693	170.0	128.7	298.7
2010	59	166965	131354	167.0	131.4	298.3

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Refinery Daily Average Crude Throughput

Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2010	60	178529	131152	178.5	131.2	309.7
2010	61	184312	123843	184.3	123.8	308.2
2010	62	178759	114937	178.8	114.9	293.7
2010	63	168049	114618	168.0	114.6	282.7
2010	64	173468	114004	173.5	114.0	287.5
2010	65	175309	108329	175.3	108.3	283.6
2010	66	169684	105615	169.7	105.6	275.3
2010	67	139461	109074	139.5	109.1	248.5
2010	68	155664	112030	155.7	112.0	267.7
2010	69	173961	111939	174.0	111.9	285.9
2010	70	176875	113460	176.9	113.5	290.3
2010	71	176119	119144	176.1	119.1	295.3
2010	72	183208	123910	183.2	123.9	307.1
2010	73	167228	121198	167.2	121.2	288.4
2010	74	180155	126708	180.2	126.7	306.9
2010	75	179877	128220	179.9	128.2	308.1
2010	76	173299	128106	173.3	128.1	301.4
2010	77	174041	120589	174.0	120.6	294.6
2010	78	172738	118171	172.7	118.2	290.9
2010	79	176002	112041	176.0	112.0	288.0
2010	80	181685	112797	181.7	112.8	294.5
2010	81	180461	115911	180.5	115.9	296.4
2010	82	183610	121576	183.6	121.6	305.2
2010	83	169421	124885	169.4	124.9	294.3
2010	84	183763	125650	183.8	125.6	309.4
2010	85	183894	125235	183.9	125.2	309.1
2010	86	184382	124959	184.4	125.0	309.3
2010	87	158617	124258	158.6	124.3	282.9
2010	88	139350	121915	139.4	121.9	261.3
2010	89	136556	123092	136.6	123.1	259.6
2010	90	145507	122741	145.5	122.7	268.2
2010	91	169647	122977	169.6	123.0	292.6
2010	92	179304	126401	179.3	126.4	305.7
2010	93	181051	122412	181.1	122.4	303.5
2010	94	188021	113173	188.0	113.2	301.2
2010	95	186722	112994	186.7	113.0	299.7
2010	96	184069	111935	184.1	111.9	296.0
2010	97	178628	111434	178.6	111.4	290.1
2010	98	181248	109951	181.2	110.0	291.2
2010	99	184071	110621	184.1	110.6	294.7
2010	100	194313	121983	194.3	122.0	316.3
2010	101	179513	121064	179.5	121.1	300.6
2010	102	177953	117996	178.0	118.0	295.9
2010	103	173408	120616	173.4	120.6	294.0
2010	104	185642	127813	185.6	127.8	313.5
2010	105	191046	139140	191.0	139.1	330.2
2010	106	182019	136875	182.0	136.9	318.9
2010	107	188980	132276	189.0	132.3	321.3
2010	108	191299	134538	191.3	134.5	325.8
2010	109	192281	139405	192.3	139.4	331.7
2010	110	189879	135786	189.9	135.8	325.7
2010	111	192704	135920	192.7	135.9	328.6
2010	112	192609	137420	192.6	137.4	330.0
2010	113	190995	130780	191.0	130.8	321.8
2010	114	188658	133795	188.7	133.8	322.5
2010	115	185583	135753	185.6	135.8	321.3
2010	116	187205	137359	187.2	137.4	324.6
2010	117	187892	136172	187.9	136.2	324.1
2010	118	168004	124239	168.0	124.2	292.2
2010	119	170493	124236	170.5	124.2	294.7
2010	120	186452	132096	186.5	132.1	318.5
2010	121	186749	139863	186.7	139.9	326.6
2010	122	185973	132101	186.0	132.1	318.1
2010	123	187470	114722	187.5	114.7	302.2
2010	124	186224	135617	186.2	135.6	321.8
2010	125	186240	140367	186.2	140.4	326.6
2010	126	187710	130776	187.7	130.8	318.5
2010	127	188664	126397	188.7	126.4	315.1
2010	128	188587	137312	188.6	137.3	325.9
2010	129	185539	138268	185.5	138.3	323.8
2010	130	184539	132487	184.5	132.5	317.0
2010	131	186407	128881	186.4	128.9	315.3
2010	132	184042	127951	184.0	128.0	312.0
2010	133	182867	125748	182.9	125.7	308.6
2010	134	184193	117536	184.2	117.5	301.7
2010	135	185288	127229	185.3	127.2	312.5

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2010	136	183821	135281	183.8	135.3	319.1
2010	137	187962	142682	188.0	142.7	330.6
2010	138	188728	142719	188.7	142.7	331.4
2010	139	189446	142518	189.4	142.5	332.0
2010	140	153189	139466	153.2	139.5	292.7
2010	141	180441	120428	180.4	120.4	300.9
2010	142	178288	119932	178.3	119.9	298.2
2010	143	179555	120826	179.6	120.8	300.4
2010	144	180394	124509	180.4	124.5	304.9
2010	145	179653	132386	179.7	132.4	312.0
2010	146	178455	135830	178.5	135.8	314.3
2010	147	178485	136222	178.5	136.2	314.7
2010	148	178798	140925	178.8	140.9	319.7
2010	149	177596	138193	177.6	138.2	315.8
2010	150	177187	142415	177.2	142.4	319.6
2010	151	177555	144098	177.6	144.1	321.7
2010	152	173374	149903	173.4	149.9	323.3
2010	153	171861	147600	171.9	147.6	319.5
2010	154	171328	140281	171.3	140.3	311.6
2010	155	175471	140391	175.5	140.4	315.9
2010	156	176032	118549	176.0	118.5	294.6
2010	157	175977	113826	176.0	113.8	289.8
2010	158	174931	116956	174.9	117.0	291.9
2010	159	174493	114162	174.5	114.2	288.7
2010	160	179549	121945	179.5	121.9	301.5
2010	161	184741	135123	184.7	135.1	319.9
2010	162	184374	140851	184.4	140.9	325.2
2010	163	185323	137239	185.3	137.2	322.6
2010	164	181293	136199	181.3	136.2	317.5
2010	165	181494	139957	181.5	140.0	321.5
2010	166	167206	149058	167.2	149.1	316.3
2010	167	162326	149394	162.3	149.4	311.7
2010	168	167444	146763	167.4	146.8	314.2
2010	169	178917	142493	178.9	142.5	321.4
2010	170	183932	140470	183.9	140.5	324.4
2010	171	186508	144164	186.5	144.2	330.7
2010	172	190569	150230	190.6	150.2	340.8
2010	173	195129	148159	195.1	148.2	343.3
2010	174	195486	151366	195.5	151.4	346.9
2010	175	187566	149760	187.6	149.8	337.3
2010	176	167867	149622	167.9	149.6	317.5
2010	177	165342	141818	165.3	141.8	307.2
2010	178	164905	140233	164.9	140.2	305.1
2010	179	166052	141366	166.1	141.4	307.4
2010	180	171597	141700	171.6	141.7	313.3
2010	181	171921	143721	171.9	143.7	315.6
2010	182	172666	144515	172.7	144.5	317.2
2010	183	169178	146284	169.2	146.3	315.5
2010	184	160435	150476	160.4	150.5	310.9
2010	185	167612	146075	167.6	146.1	313.7
2010	186	165649	148991	165.6	149.0	314.6
2010	187	164398	145741	164.4	145.7	310.1
2010	188	159885	138073	159.9	138.1	298.0
2010	189	171583	133240	171.6	133.2	304.8
2010	190	176110	130699	176.1	130.7	306.8
2010	191	182473	125078	182.5	125.1	307.6
2010	192	182757	139121	182.8	139.1	321.9
2010	193	179020	136751	179.0	136.8	315.8
2010	194	188214	132349	188.2	132.3	320.6
2010	195	187961	135976	188.0	136.0	323.9
2010	196	190886	139433	190.9	139.4	330.3
2010	197	182610	133404	182.6	133.4	316.0
2010	198	182315	128310	182.3	128.3	310.6
2010	199	187951	123997	188.0	124.0	311.9
2010	200	180634	124160	180.6	124.2	304.8
2010	201	182851	128904	182.9	128.9	311.8
2010	202	182600	128741	182.6	128.7	311.3
2010	203	185326	138255	185.3	138.3	323.6
2010	204	189998	128580	190.0	128.6	318.6
2010	205	188617	123367	188.6	123.4	312.0
2010	206	175712	123685	175.7	123.7	299.4
2010	207	174842	118997	174.8	119.0	293.8
2010	208	175097	119886	175.1	119.9	295.0
2010	209	176557	123116	176.6	123.1	299.7
2010	210	184094	127376	184.1	127.4	311.5
2010	211	189238	120812	189.2	120.8	310.1

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2010	212	190381	131830	190.4	131.8	322.2
2010	213	191839	128457	191.8	128.5	320.3
2010	214	191532	130817	191.5	130.8	322.3
2010	215	186688	134663	186.7	134.7	321.4
2010	216	184631	129396	184.6	129.4	314.0
2010	217	183689	129389	183.7	129.4	313.1
2010	218	174362	139448	174.4	139.4	313.8
2010	219	169422	146744	169.4	146.7	316.2
2010	220	177758	149840	177.8	149.8	327.6
2010	221	170884	142740	170.9	142.7	313.6
2010	222	169170	145500	169.2	145.5	314.7
2010	223	171176	147431	171.2	147.4	318.6
2010	224	173960	148521	174.0	148.5	322.5
2010	225	181499	142846	181.5	142.8	324.3
2010	226	178950	138984	178.9	139.0	317.9
2010	227	179780	136834	179.8	136.8	316.6
2010	228	179923	135126	179.9	135.1	315.0
2010	229	179956	136678	180.0	136.7	316.6
2010	230	180631	137350	180.6	137.3	318.0
2010	231	181879	137586	181.9	137.6	319.5
2010	232	181493	136338	181.5	136.3	317.8
2010	233	182593	133592	182.6	133.6	316.2
2010	234	168127	130722	168.1	130.7	298.8
2010	235	163298	124128	163.3	124.1	287.4
2010	236	175812	135315	175.8	135.3	311.1
2010	237	175644	134365	175.6	134.4	310.0
2010	238	174329	131784	174.3	131.8	306.1
2010	239	174645	131996	174.6	132.0	306.6
2010	240	175398	131997	175.4	132.0	307.4
2010	241	173911	130839	173.9	130.8	304.7
2010	242	173179	131215	173.2	131.2	304.4
2010	243	175982	129653	176.0	129.7	305.6
2010	244	175283	125338	175.3	125.3	300.6
2010	245	178767	112026	178.8	112.0	290.8
2010	246	173049	110676	173.0	110.7	283.7
2010	247	136697	123040	136.7	123.0	259.7
2010	248	136130	129494	136.1	129.5	265.6
2010	249	137453	133984	137.5	134.0	271.4
2010	250	154020	136691	154.0	136.7	290.7
2010	251	161115	130164	161.1	130.2	291.3
2010	252	165707	128341	165.7	128.3	294.0
2010	253	164921	129273	164.9	129.3	294.2
2010	254	171038	126595	171.0	126.6	297.6
2010	255	177839	130481	177.8	130.5	308.3
2010	256	180248	132618	180.2	132.6	312.9
2010	257	181817	130979	181.8	131.0	312.8
2010	258	178254	134018	178.3	134.0	312.3
2010	259	179414	140778	179.4	140.8	320.2
2010	260	180950	139373	180.9	139.4	320.3
2010	261	180960	119107	181.0	119.1	300.1
2010	262	179808	128238	179.8	128.2	308.0
2010	263	180213	133929	180.2	133.9	314.1
2010	264	180551	128065	180.6	128.1	308.6
2010	265	178689	120837	178.7	120.8	299.5
2010	266	176874	121021	176.9	121.0	297.9
2010	267	176444	125571	176.4	125.6	302.0
2010	268	179023	126606	179.0	126.6	305.6
2010	269	180353	137663	180.4	137.7	318.0
2010	270	179659	134215	179.7	134.2	313.9
2010	271	180634	121029	180.6	121.0	301.7
2010	272	178939	122539	178.9	122.5	301.5
2010	273	175357	126740	175.4	126.7	302.1
2010	274	173123	114447	173.1	114.4	287.6
2010	275	179139	115947	179.1	115.9	295.1
2010	276	178825	116010	178.8	116.0	294.8
2010	277	179558	118766	179.6	118.8	298.3
2010	278	179438	125225	179.4	125.2	304.7
2010	279	181170	120260	181.2	120.3	301.4
2010	280	180152	110037	180.2	110.0	290.2
2010	281	179869	114975	179.9	115.0	294.8
2010	282	180668	121682	180.7	121.7	302.3
2010	283	180426	119074	180.4	119.1	299.5
2010	284	178057	120011	178.1	120.0	298.1
2010	285	177898	113712	177.9	113.7	291.6
2010	286	169156	109639	169.2	109.6	278.8
2010	287	136431	113854	136.4	113.9	250.3

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2010	288	131163	117747	131.2	117.7	248.9
2010	289	132313	121229	132.3	121.2	253.5
2010	290	135344	133216	135.3	133.2	268.6
2010	291	133131	136325	133.1	136.3	269.5
2010	292	131450	137966	131.4	138.0	269.4
2010	293	128333	139839	128.3	139.8	268.2
2010	294	128851	141624	128.9	141.6	270.5
2010	295	127896	140707	127.9	140.7	268.6
2010	296	126664	131117	126.7	131.1	257.8
2010	297	127264	139194	127.3	139.2	266.5
2010	298	127193	124874	127.2	124.9	252.1
2010	299	129683	128758	129.7	128.8	258.4
2010	300	131199	123962	131.2	124.0	255.2
2010	301	129994	129900	130.0	129.9	259.9
2010	302	130529	121198	130.5	121.2	251.7
2010	303	131122	114535	131.1	114.5	245.7
2010	304	128281	118202	128.3	118.2	246.5
2010	305	131486	129309	131.5	129.3	260.8
2010	306	130195	131819	130.2	131.8	262.0
2010	307	136724	130081	136.7	130.1	266.8
2010	308	138142	131285	138.1	131.3	269.4
2010	309	139041	137377	139.0	137.4	276.4
2010	310	137751	136338	137.8	136.3	274.1
2010	311	142420	135406	142.4	135.4	277.8
2010	312	132697	137288	132.7	137.3	270.0
2010	313	134639	138984	134.6	139.0	273.6
2010	314	127822	138976	127.8	139.0	266.8
2010	315	129764	138987	129.8	139.0	268.8
2010	316	131626	139058	131.6	139.1	270.7
2010	317	128649	139999	128.6	140.0	268.6
2010	318	131370	139948	131.4	139.9	271.3
2010	319	131416	131773	131.4	131.8	263.2
2010	320	133046	114972	133.0	115.0	248.0
2010	321	132367	114857	132.4	114.9	247.2
2010	322	130149	116177	130.1	116.2	246.3
2010	323	129403	121568	129.4	121.6	251.0
2010	324	126461	118921	126.5	118.9	245.4
2010	325	129211	118996	129.2	119.0	248.2
2010	326	128104	120645	128.1	120.6	248.7
2010	327	128282	123182	128.3	123.2	251.5
2010	328	129937	122179	129.9	122.2	252.1
2010	329	128741	127186	128.7	127.2	255.9
2010	330	131807	131744	131.8	131.7	263.6
2010	331	132483	131753	132.5	131.8	264.2
2010	332	132626	127598	132.6	127.6	260.2
2010	333	130821	129071	130.8	129.1	259.9
2010	334	129925	129898	129.9	129.9	259.8
2010	335	130632	132284	130.6	132.3	262.9
2010	336	131597	128982	131.6	129.0	260.6
2010	337	132712	124351	132.7	124.4	257.1
2010	338	131494	129265	131.5	129.3	260.8
2010	339	132197	133165	132.2	133.2	265.4
2010	340	133544	133941	133.5	133.9	267.5
2010	341	134255	131778	134.3	131.8	266.0
2010	342	134756	129977	134.8	130.0	264.7
2010	343	129551	128825	129.6	128.8	258.4
2010	344	131409	130482	131.4	130.5	261.9
2010	345	132828	127389	132.8	127.4	260.2
2010	346	135312	125663	135.3	125.7	261.0
2010	347	133058	119841	133.1	119.8	252.9
2010	348	132778	116386	132.8	116.4	249.2
2010	349	131302	115436	131.3	115.4	246.7
2010	350	130030	110718	130.0	110.7	240.7
2010	351	127990	114058	128.0	114.1	242.0
2010	352	127546	118937	127.5	118.9	246.5
2010	353	125809	118997	125.8	119.0	244.8
2010	354	128545	118110	128.5	118.1	246.7
2010	355	128753	116034	128.8	116.0	244.8
2010	356	130758	115745	130.8	115.7	246.5
2010	357	130270	113902	130.3	113.9	244.2
2010	358	118064	109886	118.1	109.9	227.9
2010	359	121665	109245	121.7	109.2	230.9
2010	360	121670	109353	121.7	109.4	231.0
2010	361	120784	110030	120.8	110.0	230.8
2010	362	121870	105854	121.9	105.9	227.7
2010	363	123056	105156	123.1	105.2	228.2

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2010	364	123561	105681	123.6	105.7	229.2
2010	365	121582	107947	121.6	107.9	229.5
2011	1	121654	109763	121.7	109.8	231.4
2011	2	122400	117194	122.4	117.2	239.6
2011	3	125229	117516	125.2	117.5	242.7
2011	4	131794	116251	131.8	116.3	248.0
2011	5	133292	115001	133.3	115.0	248.3
2011	6	133895	116254	133.9	116.3	250.1
2011	7	136355	119858	136.4	119.9	256.2
2011	8	138872	123528	138.9	123.5	262.4
2011	9	153699	123254	153.7	123.3	277.0
2011	10	163291	122840	163.3	122.8	286.1
2011	11	178472	123601	178.5	123.6	302.1
2011	12	187489	125407	187.5	125.4	312.9
2011	13	189400	124992	189.4	125.0	314.4
2011	14	194419	124955	194.4	125.0	319.4
2011	15	195998	123758	196.0	123.8	319.8
2011	16	196015	123458	196.0	123.5	319.5
2011	17	193456	119153	193.5	119.2	312.6
2011	18	193215	113769	193.2	113.8	307.0
2011	19	193480	117162	193.5	117.2	310.6
2011	20	193801	122442	193.8	122.4	316.2
2011	21	191584	122473	191.6	122.5	314.1
2011	22	190136	119127	190.1	119.1	309.3
2011	23	189995	118915	190.0	118.9	308.9
2011	24	190912	116015	190.9	116.0	306.9
2011	25	187070	118124	187.1	118.1	305.2
2011	26	180280	126399	180.3	126.4	306.7
2011	27	181744	129230	181.7	129.2	311.0
2011	28	183173	124805	183.2	124.8	308.0
2011	29	181271	128967	181.3	129.0	310.2
2011	30	181387	124773	181.4	124.8	306.2
2011	31	180231	120983	180.2	121.0	301.2
2011	32	182139	117238	182.1	117.2	299.4
2011	33	183449	113492	183.4	113.5	296.9
2011	34	182147	113466	182.1	113.5	295.6
2011	35	180579	112966	180.6	113.0	293.5
2011	36	162446	111939	162.4	111.9	274.4
2011	37	70647	111616	70.6	111.6	182.3
2011	38	8184	115771	8.2	115.8	124.0
2011	39	9398	118543	9.4	118.5	127.9
2011	40	6055	113719	6.1	113.7	119.8
2011	41	10030	115934	10.0	115.9	126.0
2011	42	12708	113042	12.7	113.0	125.8
2011	43	10647	112464	10.6	112.5	123.1
2011	44	4698	112194	4.7	112.2	116.9
2011	45	6952	113557	7.0	113.6	120.5
2011	46	8972	114856	9.0	114.9	123.8
2011	47	6604	118673	6.6	118.7	125.3
2011	48	8885	118885	8.9	118.9	127.8
2011	49	6605	116795	6.6	116.8	123.4
2011	50	4947	118830	4.9	118.8	123.8
2011	51	12925	119893	12.9	119.9	132.8
2011	52	7468	119861	7.5	119.9	127.3
2011	53	11235	117346	11.2	117.3	128.6
2011	54	14398	114523	14.4	114.5	128.9
2011	55	41750	116666	41.8	116.7	158.4
2011	56	65113	116162	65.1	116.2	181.3
2011	57	110344	118973	110.3	119.0	229.3
2011	58	158542	123259	158.5	123.3	281.8
2011	59	170190	123761	170.2	123.8	294.0
2011	60	173917	125287	173.9	125.3	299.2
2011	61	177173	125330	177.2	125.3	302.5
2011	62	175924	125208	175.9	125.2	301.1
2011	63	168783	114388	168.8	114.4	283.2
2011	64	156370	102525	156.4	102.5	258.9
2011	65	152175	103303	152.2	103.3	255.5
2011	66	133864	102704	133.9	102.7	236.6
2011	67	125064	102255	125.1	102.3	227.3
2011	68	126646	105517	126.6	105.5	232.2
2011	69	128182	103883	128.2	103.9	232.1
2011	70	127447	105012	127.4	105.0	232.5
2011	71	121613	104817	121.6	104.8	226.4
2011	72	115339	100653	115.3	100.7	216.0
2011	73	119483	105104	119.5	105.1	224.6
2011	74	119468	104574	119.5	104.6	224.0

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2011	75	61859	104680	61.9	104.7	166.5
2011	76	3485	104502	3.5	104.5	108.0
2011	77	3304	105015	3.3	105.0	108.3
2011	78	3836	104893	3.8	104.9	108.7
2011	79	30476	104967	30.5	105.0	135.4
2011	80	126017	104828	126.0	104.8	230.8
2011	81	128375	104902	128.4	104.9	233.3
2011	82	131480	104058	131.5	104.1	235.5
2011	83	123398	104201	123.4	104.2	227.6
2011	84	114132	103646	114.1	103.6	217.8
2011	85	100610	101955	100.6	102.0	202.6
2011	86	88871	102879	88.9	102.9	191.7
2011	87	83096	102856	83.1	102.9	186.0
2011	88	74604	102937	74.6	102.9	177.5
2011	89	74174	102914	74.2	102.9	177.1
2011	90	74794	100114	74.8	100.1	174.9
2011	91	62457	95941	62.5	95.9	158.4
2011	92	47743	93840	47.7	93.8	141.6
2011	93	33586	93849	33.6	93.8	127.4
2011	94	27120	95675	27.1	95.7	122.8
2011	95	45148	97218	45.1	97.2	142.4
2011	96	13645	100278	13.6	100.3	113.9
2011	97	5762	103265	5.8	103.3	109.0
2011	98	58366	103551	58.4	103.6	161.9
2011	99	139435	104515	139.4	104.5	243.9
2011	100	152554	106763	152.6	106.8	259.3
2011	101	155944	102277	155.9	102.3	258.2
2011	102	169158	105337	169.2	105.3	274.5
2011	103	166394	104907	166.4	104.9	271.3
2011	104	127071	105926	127.1	105.9	233.0
2011	105	125284	105523	125.3	105.5	230.8
2011	106	127147	103263	127.1	103.3	230.4
2011	107	127489	102566	127.5	102.6	230.1
2011	108	128813	104155	128.8	104.2	233.0
2011	109	127016	106106	127.0	106.1	233.1
2011	110	128002	104926	128.0	104.9	232.9
2011	111	127759	104965	127.8	105.0	232.7
2011	112	123647	105127	123.6	105.1	228.8
2011	113	131285	106158	131.3	106.2	237.4
2011	114	142217	105272	142.2	105.3	247.5
2011	115	161428	102922	161.4	102.9	264.4
2011	116	172148	104997	172.1	105.0	277.1
2011	117	175240	105914	175.2	105.9	281.2
2011	118	176307	105576	176.3	105.6	281.9
2011	119	174219	105193	174.2	105.2	279.4
2011	120	172297	105016	172.3	105.0	277.3
2011	121	173349	105012	173.3	105.0	278.4
2011	122	175906	105071	175.9	105.1	281.0
2011	123	175903	105014	175.9	105.0	280.9
2011	124	177346	108578	177.3	108.6	285.9
2011	125	184215	113599	184.2	113.6	297.8
2011	126	186873	118020	186.9	118.0	304.9
2011	127	183191	124184	183.2	124.2	307.4
2011	128	184794	124410	184.8	124.4	309.2
2011	129	183765	124469	183.8	124.5	308.2
2011	130	180050	120112	180.0	120.1	300.2
2011	131	184970	115019	185.0	115.0	300.0
2011	132	186863	116798	186.9	116.8	303.7
2011	133	184147	113125	184.1	113.1	297.3
2011	134	187191	113206	187.2	113.2	300.4
2011	135	186078	110928	186.1	110.9	297.0
2011	136	183313	110551	183.3	110.6	293.9
2011	137	184242	111718	184.2	111.7	296.0
2011	138	185994	112196	186.0	112.2	298.2
2011	139	186477	120724	186.5	120.7	307.2
2011	140	184640	120104	184.6	120.1	304.7
2011	141	186206	121590	186.2	121.6	307.8
2011	142	185276	123585	185.3	123.6	308.9
2011	143	186656	122467	186.7	122.5	309.1
2011	144	186094	121076	186.1	121.1	307.2
2011	145	187761	121919	187.8	121.9	309.7
2011	146	188930	122861	188.9	122.9	311.8
2011	147	183843	119224	183.8	119.2	303.1
2011	148	184746	116786	184.7	116.8	301.5
2011	149	179686	111184	179.7	111.2	290.9
2011	150	182845	110998	182.8	111.0	293.8

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2011	151	184961	111004	185.0	111.0	296.0
2011	152	188425	111852	188.4	111.9	300.3
2011	153	187328	112371	187.3	112.4	299.7
2011	154	185040	114014	185.0	114.0	299.1
2011	155	187391	110387	187.4	110.4	297.8
2011	156	187894	108387	187.9	108.4	296.3
2011	157	186853	107450	186.9	107.5	294.3
2011	158	186947	103236	186.9	103.2	290.2
2011	159	187308	106622	187.3	106.6	293.9
2011	160	190613	121362	190.6	121.4	312.0
2011	161	194785	123857	194.8	123.9	318.6
2011	162	199698	123301	199.7	123.3	323.0
2011	163	200014	120727	200.0	120.7	320.7
2011	164	198352	122048	198.4	122.0	320.4
2011	165	187214	122520	187.2	122.5	309.7
2011	166	190202	120993	190.2	121.0	311.2
2011	167	189844	123370	189.8	123.4	313.2
2011	168	189499	126584	189.5	126.6	316.1
2011	169	159370	126407	159.4	126.4	285.8
2011	170	149620	118561	149.6	118.6	268.2
2011	171	145129	117791	145.1	117.8	262.9
2011	172	140811	113581	140.8	113.6	254.4
2011	173	148174	111724	148.2	111.7	259.9
2011	174	172181	110994	172.2	111.0	283.2
2011	175	179274	106817	179.3	106.8	286.1
2011	176	180129	112464	180.1	112.5	292.6
2011	177	179502	114368	179.5	114.4	293.9
2011	178	179715	120556	179.7	120.6	300.3
2011	179	174896	124684	174.9	124.7	299.6
2011	180	184452	120466	184.5	120.5	304.9
2011	181	187572	115441	187.6	115.4	303.0
2011	182	188779	106923	188.8	106.9	295.7
2011	183	188997	116277	189.0	116.3	305.3
2011	184	190464	116442	190.5	116.4	306.9
2011	185	188176	115327	188.2	115.3	303.5
2011	186	188081	116837	188.1	116.8	304.9
2011	187	185857	117989	185.9	118.0	303.8
2011	188	188516	116581	188.5	116.6	305.1
2011	189	1739362	120251	174.0	120.3	294.2
2011	190	182702	121130	182.7	121.1	303.8
2011	191	182902	123895	182.9	123.9	306.8
2011	192	186903	123125	186.9	123.1	310.0
2011	193	184374	110625	184.4	110.6	295.0
2011	194	181962	111823	182.0	111.8	293.8
2011	195	181648	116083	181.6	116.1	297.7
2011	196	191079	119661	191.1	119.7	310.7
2011	197	190434	123018	190.4	123.0	313.5
2011	198	190834	123930	190.8	123.9	314.8
2011	199	189894	123171	189.9	123.2	313.1
2011	200	190597	117383	190.6	117.4	308.0
2011	201	191013	117816	191.0	117.8	308.8
2011	202	191078	120121	191.1	120.1	311.2
2011	203	186597	118291	186.6	118.3	304.9
2011	204	188378	115671	188.4	115.7	304.0
2011	205	188030	117024	188.0	117.0	305.1
2011	206	188445	115876	188.4	115.9	304.3
2011	207	189200	114245	189.2	114.2	303.4
2011	208	191914	120963	191.9	121.0	312.9
2011	209	190536	124744	190.5	124.7	315.3
2011	210	187669	126929	187.7	126.9	314.6
2011	211	182707	126246	182.7	126.2	309.0
2011	212	179571	122276	179.6	122.3	301.8
2011	213	178376	120873	178.4	120.9	299.2
2011	214	193020	123277	193.0	123.3	316.3
2011	215	196576	123810	196.6	123.8	320.4
2011	216	190984	125855	191.0	125.9	316.8
2011	217	193844	128758	193.8	128.8	322.6
2011	218	194040	127410	194.0	127.4	321.5
2011	219	193056	125258	193.1	125.3	318.3
2011	220	187700	126182	187.7	126.2	313.9
2011	221	174321	125947	174.3	125.9	300.3
2011	222	160820	124424	160.8	124.4	285.2
2011	223	182522	126931	182.5	126.9	309.5
2011	224	188128	127907	188.1	127.9	316.0
2011	225	186958	126623	187.0	126.6	313.6
2011	226	186692	126670	186.7	126.7	313.4

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2011	227	185925	130035	185.9	130.0	316.0
2011	228	186121	128164	186.1	128.2	314.3
2011	229	181589	127216	181.6	127.2	308.8
2011	230	183855	127130	183.9	127.1	311.0
2011	231	182340	122824	182.3	122.8	305.2
2011	232	182374	122880	182.4	122.9	305.3
2011	233	184630	123945	184.6	123.9	308.6
2011	234	181763	124125	181.8	124.1	305.9
2011	235	186264	125321	186.3	125.3	311.6
2011	236	185048	71034	185.0	71.0	256.1
2011	237	190427	52431	190.4	52.4	242.9
2011	238	172556	54737	172.6	54.7	227.3
2011	239	136475	53807	136.5	53.8	190.3
2011	240	73816	55895	73.8	55.9	129.7
2011	241	36981	60675	37.0	60.7	97.7
2011	242	28896	62530	28.9	62.5	91.4
2011	243	48260	61067	48.3	61.1	109.3
2011	244	116452	69534	116.5	69.5	186.0
2011	245	154224	87835	154.2	87.8	242.1
2011	246	183062	101887	183.1	101.9	284.9
2011	247	182827	105119	182.8	105.1	287.9
2011	248	184239	125722	184.2	125.7	310.0
2011	249	185449	127116	185.4	127.1	312.6
2011	250	186927	125873	186.9	125.9	312.8
2011	251	176458	124013	176.5	124.0	300.5
2011	252	181498	127231	181.5	127.2	308.7
2011	253	182048	134572	182.0	134.6	316.6
2011	254	180962	135083	181.0	135.1	316.0
2011	255	182034	131949	182.0	131.9	314.0
2011	256	182144	122878	182.1	122.9	305.0
2011	257	182331	122380	182.3	122.4	304.7
2011	258	178960	110777	179.0	110.8	289.7
2011	259	176824	109134	176.8	109.1	286.0
2011	260	177955	110014	178.0	110.0	288.0
2011	261	179691	110014	179.7	110.0	289.7
2011	262	179643	110069	179.6	110.1	289.7
2011	263	177839	109859	177.8	109.9	287.7
2011	264	178068	109944	178.1	109.9	288.0
2011	265	177745	109994	177.7	110.0	287.7
2011	266	176891	109982	176.9	110.0	286.9
2011	267	177011	110898	177.0	110.9	287.9
2011	268	170044	109872	170.0	109.9	279.9
2011	269	126201	109976	126.2	110.0	236.2
2011	270	123457	109981	123.5	110.0	233.4
2011	271	138242	109833	138.2	109.8	248.1
2011	272	182362	109731	182.4	109.7	292.1
2011	273	183491	109643	183.5	109.6	293.1
2011	274	184307	109936	184.3	109.9	294.2
2011	275	186241	109949	186.2	109.9	296.2
2011	276	187102	115704	187.1	115.7	302.8
2011	277	186339	124484	186.3	124.5	310.8
2011	278	186148	124834	186.1	124.8	311.0
2011	279	187200	124483	187.2	124.5	311.7
2011	280	186058	124936	186.1	124.9	311.0
2011	281	186208	124646	186.2	124.6	310.9
2011	282	186425	124716	186.4	124.7	311.1
2011	283	185263	124900	185.3	124.9	310.2
2011	284	189534	124915	189.5	124.9	314.4
2011	285	192965	123815	193.0	123.8	316.8
2011	286	193158	121979	193.2	122.0	315.1
2011	287	193200	119444	193.2	119.4	312.6
2011	288	189984	120977	190.0	121.0	311.0
2011	289	192505	125539	192.5	125.5	318.0
2011	290	192150	124024	192.2	124.0	316.2
2011	291	186258	119993	186.3	120.0	306.3
2011	292	187441	120042	187.4	120.0	307.5
2011	293	185556	119913	185.6	119.9	305.5
2011	294	186765	118972	186.8	119.0	305.7
2011	295	186272	112132	186.3	112.1	298.4
2011	296	186484	113018	186.5	113.0	299.5
2011	297	186305	113859	186.3	113.9	300.2
2011	298	186821	111165	186.8	111.2	298.0
2011	299	186381	110303	186.4	110.3	296.7
2011	300	186435	113029	186.4	113.0	299.5
2011	301	182999	115470	183.0	115.5	298.5
2011	302	185867	113629	185.9	113.6	299.5

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2011	303	186593	112997	186.6	113.0	299.6
2011	304	186644	114081	186.6	114.1	300.7
2011	305	184611	115755	184.6	115.8	300.4
2011	306	186381	119799	186.4	119.8	306.2
2011	307	184903	119961	184.9	120.0	304.9
2011	308	186114	120000	186.1	120.0	306.1
2011	309	185554	119994	185.6	120.0	305.5
2011	310	193734	124979	193.7	125.0	318.7
2011	311	185685	119991	185.7	120.0	305.7
2011	312	186196	119987	186.2	120.0	306.2
2011	313	175584	113263	175.6	113.3	288.8
2011	314	165883	118661	165.9	118.7	284.5
2011	315	170550	104893	170.5	104.9	275.4
2011	316	172904	96243	172.9	96.2	269.1
2011	317	183005	113159	183.0	113.2	296.2
2011	318	188257	119975	188.3	120.0	308.2
2011	319	189004	119975	189.0	120.0	309.0
2011	320	189024	119947	189.0	119.9	309.0
2011	321	187295	119974	187.3	120.0	307.3
2011	322	188348	119780	188.3	119.8	308.1
2011	323	187631	119995	187.6	120.0	307.6
2011	324	179350	120022	179.3	120.0	299.4
2011	325	176908	120006	176.9	120.0	296.9
2011	326	180093	119953	180.1	120.0	300.0
2011	327	179937	119924	179.9	119.9	299.9
2011	328	177081	116746	177.1	116.7	293.8
2011	329	177565	114080	177.6	114.1	291.6
2011	330	171633	109996	171.6	110.0	281.6
2011	331	172047	109992	172.0	110.0	282.0
2011	332	168040	111458	168.0	111.5	279.5
2011	333	174554	119720	174.6	119.7	294.3
2011	334	166658	119731	166.7	119.7	286.4
2011	335	172510	115786	172.5	115.8	288.3
2011	336	189662	114662	189.7	114.7	304.3
2011	337	190255	114691	190.3	114.7	304.9
2011	338	191767	115009	191.8	115.0	306.8
2011	339	192801	115146	192.8	115.1	307.9
2011	340	188981	115021	189.0	115.0	304.0
2011	341	184038	115009	184.0	115.0	299.0
2011	342	183649	113017	183.6	113.0	296.7
2011	343	184175	114187	184.2	114.2	298.4
2011	344	185713	114702	185.7	114.7	300.4
2011	345	185009	114879	185.0	114.9	299.9
2011	346	183315	114984	183.3	115.0	298.3
2011	347	184416	115005	184.4	115.0	299.4
2011	348	181994	115000	182.0	115.0	297.0
2011	349	185466	115010	185.5	115.0	300.5
2011	350	184702	115009	184.7	115.0	299.7
2011	351	185088	115014	185.1	115.0	300.1
2011	352	183556	115011	183.6	115.0	298.6
2011	353	176049	114978	176.0	115.0	291.0
2011	354	173064	114996	173.1	115.0	288.1
2011	355	181114	115001	181.1	115.0	296.1
2011	356	183208	114992	183.2	115.0	298.2
2011	357	181802	115006	181.8	115.0	296.8
2011	358	183908	114977	183.9	115.0	298.9
2011	359	183177	114968	183.2	115.0	298.1
2011	360	184012	115005	184.0	115.0	299.0
2011	361	184072	115024	184.1	115.0	299.1
2011	362	184764	114991	184.8	115.0	299.8
2011	363	181960	114966	182.0	115.0	296.9
2011	364	181352	115001	181.4	115.0	296.4
2011	365	183371	114991	183.4	115.0	298.4
2012	1	183849	114980	183.8	115.0	298.8
2012	2	184389	114987	184.4	115.0	299.4
2012	3	185148	114972	185.1	115.0	300.1
2012	4	178860	115033	178.9	115.0	293.9
2012	5	173692	114995	173.7	115.0	288.7
2012	6	183825	114987	183.8	115.0	298.8
2012	7	185167	114982	185.2	115.0	300.1
2012	8	185619	115000	185.6	115.0	300.6
2012	9	187825	114481	187.8	114.5	302.3
2012	10	187876	114988	187.9	115.0	302.9
2012	11	187086	114996	187.1	115.0	302.1
2012	12	184838	115002	184.8	115.0	299.8
2012	13	184296	114918	184.3	114.9	299.2

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2012	14	187914	114896	187.9	114.9	302.8
2012	15	187128	114999	187.1	115.0	302.1
2012	16	185184	114190	185.2	114.2	299.4
2012	17	181216	108970	181.2	109.0	290.2
2012	18	179614	108152	179.6	108.2	287.8
2012	19	183370	102376	183.4	102.4	285.7
2012	20	173798	102573	173.8	102.6	276.4
2012	21	177399	101968	177.4	102.0	279.4
2012	22	176211	101304	176.2	101.3	277.5
2012	23	175488	100056	175.5	100.1	275.5
2012	24	181002	100034	181.0	100.0	281.0
2012	25	182073	99167	182.1	99.2	281.2
2012	26	184074	98981	184.1	99.0	283.1
2012	27	182262	105850	182.3	105.9	288.1
2012	28	186346	114936	186.3	114.9	301.3
2012	29	186085	116671	186.1	116.7	302.8
2012	30	184801	116280	184.8	116.3	301.1
2012	31	184181	115859	184.2	115.9	300.0
2012	32	184082	121858	184.1	121.9	305.9
2012	33	183490	119977	183.5	120.0	303.5
2012	34	180565	110351	180.6	110.4	290.9
2012	35	177820	108066	177.8	108.1	285.9
2012	36	176324	106946	176.3	106.9	283.3
2012	37	166055	95018	166.1	95.0	261.1
2012	38	144751	95008	144.8	95.0	239.8
2012	39	140307	103834	140.3	103.8	244.1
2012	40	172566	114404	172.6	114.4	287.0
2012	41	186385	115051	186.4	115.1	301.4
2012	42	182685	117117	182.7	117.1	299.8
2012	43	179847	125348	179.8	125.3	305.2
2012	44	186341	127976	186.3	128.0	314.3
2012	45	188040	125042	188.0	125.0	313.1
2012	46	186682	123024	186.7	123.0	309.7
2012	47	184124	115674	184.1	115.7	299.8
2012	48	184956	117815	185.0	117.8	302.8
2012	49	184919	122384	184.9	122.4	307.3
2012	50	184106	117710	184.1	117.7	301.8
2012	51	184813	113590	184.8	113.6	298.4
2012	52	183559	124841	183.6	124.8	308.4
2012	53	183680	122731	183.7	122.7	306.4
2012	54	171545	119299	171.5	119.3	290.8
2012	55	165305	114069	165.3	114.1	279.4
2012	56	158204	109056	158.2	109.1	267.3
2012	57	157002	109238	157.0	109.2	266.2
2012	58	160538	116165	160.5	116.2	276.7
2012	59	162269	108311	162.3	108.3	270.6
2012	60	180186	110986	180.2	111.0	291.2
2012	61	180107	110803	180.1	110.8	290.9
2012	62	177813	108901	177.8	108.9	286.7
2012	63	177743	108575	177.7	108.6	286.3
2012	64	173011	110990	173.0	111.0	284.0
2012	65	182720	109474	182.7	109.5	292.2
2012	66	173757	107770	173.8	107.8	281.5
2012	67	160710	109934	160.7	109.9	270.6
2012	68	161114	109416	161.1	109.4	270.5
2012	69	154093	105905	154.1	105.9	260.0
2012	70	178763	108293	178.8	108.3	287.1
2012	71	172816	115431	172.8	115.4	288.2
2012	72	180647	123945	180.6	123.9	304.6
2012	73	183691	122307	183.7	122.3	306.0
2012	74	183740	122606	183.7	122.6	306.3
2012	75	185708	123001	185.7	123.0	308.7
2012	76	187085	122987	187.1	123.0	310.1
2012	77	188341	118750	188.3	118.7	307.1
2012	78	187531	116021	187.5	116.0	303.6
2012	79	185385	119164	185.4	119.2	304.5
2012	80	187437	123530	187.4	123.5	311.0
2012	81	188829	120716	188.8	120.7	309.5
2012	82	187818	122360	187.8	122.4	310.2
2012	83	187819	124312	187.8	124.3	312.1
2012	84	189473	121113	189.5	121.1	310.6
2012	85	188653	121067	188.7	121.1	309.7
2012	86	185730	119141	185.7	119.1	304.9
2012	87	184324	119005	184.3	119.0	303.3
2012	88	183479	113355	183.5	113.4	296.8
2012	89	178278	110218	178.3	110.2	288.5

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2012	90	174900	109709	174.9	109.7	284.6
2012	91	184317	111926	184.3	111.9	296.2
2012	92	186113	114091	186.1	114.1	300.2
2012	93	185877	117298	185.9	117.3	303.2
2012	94	189957	119368	190.0	119.4	309.3
2012	95	180543	119565	180.5	119.6	300.1
2012	96	179470	120866	179.5	120.9	300.3
2012	97	187069	122825	187.1	122.8	309.9
2012	98	189228	119515	189.2	119.5	308.7
2012	99	188441	119013	188.4	119.0	307.5
2012	100	185041	118588	185.0	118.6	303.6
2012	101	186261	117505	186.3	117.5	303.8
2012	102	187752	112730	187.8	112.7	300.5
2012	103	187555	113130	187.6	113.1	300.7
2012	104	187215	111223	187.2	111.2	298.4
2012	105	189842	117858	189.8	117.9	307.7
2012	106	186932	119350	186.9	119.4	306.3
2012	107	181081	120005	181.1	120.0	301.1
2012	108	182464	118452	182.5	118.5	300.9
2012	109	184071	110587	184.1	110.6	294.7
2012	110	184432	108012	184.4	108.0	292.4
2012	111	183540	109875	183.5	109.9	293.4
2012	112	184936	110627	184.9	110.6	295.6
2012	113	187243	114046	187.2	114.0	301.3
2012	114	189854	116818	189.9	116.8	306.7
2012	115	186330	115336	186.3	115.3	301.7
2012	116	187223	118056	187.2	118.1	305.3
2012	117	189632	118657	189.6	118.7	308.3
2012	118	193578	120008	193.6	120.0	313.6
2012	119	190615	119992	190.6	120.0	310.6
2012	120	184821	119995	184.8	120.0	304.8
2012	121	182273	120297	182.3	120.3	302.6
2012	122	193714	121634	193.7	121.6	315.3
2012	123	194421	123556	194.4	123.6	318.0
2012	124	194368	124815	194.4	124.8	319.2
2012	125	190005	124269	190.0	124.3	314.3
2012	126	189968	123269	190.0	123.3	313.2
2012	127	189151	124883	189.2	124.9	314.0
2012	128	190446	123868	190.4	123.9	314.3
2012	129	189078	119996	189.1	120.0	309.1
2012	130	83449	124812	83.4	124.8	208.3
2012	131	144	132194	0.1	132.2	132.3
2012	132	0	134786	0.0	134.8	134.8
2012	133	0	136055	0.0	136.1	136.1
2012	134	0	135853	0.0	135.9	135.9
2012	135	0	138249	0.0	138.2	138.2
2012	136	24	137426	0.0	137.4	137.4
2012	137	22867	136858	22.9	136.9	159.7
2012	138	54641	136854	54.6	136.9	191.5
2012	139	134347	132118	134.3	132.1	266.5
2012	140	159618	125588	159.6	125.6	285.2
2012	141	181117	122153	181.1	122.2	303.3
2012	142	183186	120894	183.2	120.9	304.1
2012	143	183220	119197	183.2	119.2	302.4
2012	144	167049	116931	167.0	116.9	284.0
2012	145	146026	116905	146.0	116.9	262.9
2012	146	142905	112466	142.9	112.5	255.4
2012	147	141250	109783	141.3	109.8	251.0
2012	148	154599	107496	154.6	107.5	262.1
2012	149	161061	108357	161.1	108.4	269.4
2012	150	156857	108001	156.9	108.0	264.9
2012	151	160381	108000	160.4	108.0	268.4
2012	152	185741	110813	185.7	110.8	296.6
2012	153	191195	116913	191.2	116.9	308.1
2012	154	191448	117912	191.4	117.9	309.4
2012	155	189685	117996	189.7	118.0	307.7
2012	156	187215	117980	187.2	118.0	305.2
2012	157	188422	118349	188.4	118.3	306.8
2012	158	186144	120211	186.1	120.2	306.4
2012	159	190607	122950	190.6	122.9	313.6
2012	160	188211	124181	188.2	124.2	312.4
2012	161	184068	121025	184.1	121.0	305.1
2012	162	190730	119995	190.7	120.0	310.7
2012	163	189755	123303	189.8	123.3	313.1
2012	164	179611	125879	179.6	125.9	305.5
2012	165	180204	123308	180.2	123.3	303.5

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2012	166	176402	119531	176.4	119.5	295.9
2012	167	177025	119873	177.0	119.9	296.9
2012	168	183091	122488	183.1	122.5	305.6
2012	169	179099	124772	179.1	124.8	303.9
2012	170	178187	122948	178.2	122.9	301.1
2012	171	186923	120235	186.9	120.2	307.2
2012	172	168959	112831	169.0	112.8	281.8
2012	173	153871	110509	153.9	110.5	264.4
2012	174	155235	114134	155.2	114.1	269.4
2012	175	161874	119651	161.9	119.7	281.5
2012	176	160110	119990	160.1	120.0	280.1
2012	177	162601	119990	162.6	120.0	282.6
2012	178	167831	120206	167.8	120.2	288.0
2012	179	167918	120751	167.9	120.8	288.7
2012	180	169191	119999	169.2	120.0	289.2
2012	181	165553	116906	165.6	116.9	282.5
2012	182	163595	113227	163.6	113.2	276.8
2012	183	164039	111449	164.0	111.4	275.5
2012	184	164377	112699	164.4	112.7	277.1
2012	185	166359	115693	166.4	115.7	282.1
2012	186	167361	115718	167.4	115.7	283.1
2012	187	167934	111961	167.9	112.0	279.9
2012	188	167342	115955	167.3	116.0	283.3
2012	189	167436	109597	167.4	109.6	277.0
2012	190	158862	110477	158.9	110.5	269.3
2012	191	159348	116057	159.3	116.1	275.4
2012	192	156396	115818	156.4	115.8	272.2
2012	193	167139	115613	167.1	115.6	282.8
2012	194	176324	113185	176.3	113.2	289.5
2012	195	167219	117751	167.2	117.8	285.0
2012	196	167163	121946	167.2	121.9	289.1
2012	197	170322	117343	170.3	117.3	287.7
2012	198	174526	114353	174.5	114.4	288.9
2012	199	182722	119125	182.7	119.1	301.8
2012	200	180546	116705	180.5	116.7	297.3
2012	201	180433	115959	180.4	116.0	296.4
2012	202	182340	119425	182.3	119.4	301.8
2012	203	183069	119477	183.1	119.5	302.5
2012	204	183407	119445	183.4	119.4	302.9
2012	205	182453	116367	182.5	116.4	298.8
2012	206	177225	106995	177.2	107.0	284.2
2012	207	177908	112187	177.9	112.2	290.1
2012	208	172319	114525	172.3	114.5	286.8
2012	209	170424	113746	170.4	113.7	284.2
2012	210	169538	110934	169.5	110.9	280.5
2012	211	174869	116353	174.9	116.4	291.2
2012	212	173813	115752	173.8	115.8	289.6
2012	213	175427	119290	175.4	119.3	294.7
2012	214	174290	119786	174.3	119.8	294.1
2012	215	172028	118262	172.0	118.3	290.3
2012	216	165647	118450	165.6	118.5	284.1
2012	217	166772	117587	166.8	117.6	284.4
2012	218	168102	117400	168.1	117.4	285.5
2012	219	160895	119651	160.9	119.7	280.5
2012	220	162626	119018	162.6	119.0	281.6
2012	221	166148	119665	166.1	119.7	285.8
2012	222	164821	119987	164.8	120.0	284.8
2012	223	170981	120943	171.0	120.9	291.9
2012	224	171776	121447	171.8	121.4	293.2
2012	225	168314	121879	168.3	121.9	290.2
2012	226	163272	122880	163.3	122.9	286.2
2012	227	164122	124648	164.1	124.6	288.8
2012	228	169965	123021	170.0	123.0	293.0
2012	229	174964	121505	175.0	121.5	296.5
2012	230	177356	121809	177.4	121.8	299.2
2012	231	170455	123703	170.5	123.7	294.2
2012	232	170060	123451	170.1	123.5	293.5
2012	233	173226	118216	173.2	118.2	291.4
2012	234	175572	118020	175.6	118.0	293.6
2012	235	170266	119117	170.3	119.1	289.4
2012	236	170436	119960	170.4	120.0	290.4
2012	237	179073	119991	179.1	120.0	299.1
2012	238	184405	119995	184.4	120.0	304.4
2012	239	185085	122390	185.1	122.4	307.5
2012	240	185868	121921	185.9	121.9	307.8
2012	241	176793	118827	176.8	118.8	295.6

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Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2012	242	184050	114442	184.0	114.4	298.5
2012	243	184821	114714	184.8	114.7	299.5
2012	244	184256	114667	184.3	114.7	298.9
2012	245	185232	114933	185.2	114.9	300.2
2012	246	184537	113426	184.5	113.4	298.0
2012	247	184517	111694	184.5	111.7	296.2
2012	248	178544	113507	178.5	113.5	292.1
2012	249	175113	118556	175.1	118.6	293.7
2012	250	181818	114785	181.8	114.8	296.6
2012	251	178802	110594	178.8	110.6	289.4
2012	252	181082	111185	181.1	111.2	292.3
2012	253	186492	109902	186.5	109.9	296.4
2012	254	188304	113175	188.3	113.2	301.5
2012	255	184639	114935	184.6	114.9	299.6
2012	256	183785	114775	183.8	114.8	298.6
2012	257	183783	114723	183.8	114.7	298.5
2012	258	183505	112331	183.5	112.3	295.8
2012	259	183150	111798	183.2	111.8	294.9
2012	260	179265	106110	179.3	106.1	285.4
2012	261	183080	108057	183.1	108.1	291.1
2012	262	186328	113664	186.3	113.7	300.0
2012	263	188363	116609	188.4	116.6	305.0
2012	264	188755	120195	188.8	120.2	309.0
2012	265	186080	113873	186.1	113.9	300.0
2012	266	189662	112367	189.7	112.4	302.0
2012	267	190888	114888	190.9	114.9	305.8
2012	268	186090	118716	186.1	118.7	304.8
2012	269	191063	119949	191.1	119.9	311.0
2012	270	192606	119570	192.6	119.6	312.2
2012	271	188234	117989	188.2	118.0	306.2
2012	272	179569	117145	179.6	117.1	296.7
2012	273	173277	122501	173.3	122.5	295.8
2012	274	193412	125986	193.4	126.0	319.4
2012	275	193348	125872	193.3	125.9	319.2
2012	276	193705	121431	193.7	121.4	315.1
2012	277	189518	117279	189.5	117.3	306.8
2012	278	188429	118515	188.4	118.5	306.9
2012	279	187206	121064	187.2	121.1	308.3
2012	280	181897	121900	181.9	121.9	303.8
2012	281	184491	125078	184.5	125.1	309.6
2012	282	186665	125059	186.7	125.1	311.7
2012	283	186406	120722	186.4	120.7	307.1
2012	284	185320	119048	185.3	119.0	304.4
2012	285	189630	119878	189.6	119.9	309.5
2012	286	193095	123669	193.1	123.7	316.8
2012	287	193774	123988	193.8	124.0	317.8
2012	288	194308	124329	194.3	124.3	318.6
2012	289	193171	125910	193.2	125.9	319.1
2012	290	195402	126509	195.4	126.5	321.9
2012	291	193837	126635	193.8	126.6	320.5
2012	292	187275	123879	187.3	123.9	311.2
2012	293	192203	123603	192.2	123.6	315.8
2012	294	195257	123960	195.3	124.0	319.2
2012	295	197618	123668	197.6	123.7	321.3
2012	296	195612	124870	195.6	124.9	320.5
2012	297	194013	124996	194.0	125.0	319.0
2012	298	197102	126061	197.1	126.1	323.2
2012	299	190997	129296	191.0	129.3	320.3
2012	300	191790	129947	191.8	129.9	321.7
2012	301	188912	131463	188.9	131.5	320.4
2012	302	168388	123220	168.4	123.2	291.6
2012	303	130429	52367	130.4	52.4	182.8
2012	304	143064	39755	143.1	39.8	182.8
2012	305	146913	92707	146.9	92.7	239.6
2012	306	153760	110896	153.8	110.9	264.7
2012	307	160500	114976	160.5	115.0	275.5
2012	308	160893	115641	160.9	115.6	276.5
2012	309	187722	115772	187.7	115.8	303.5
2012	310	189707	112357	189.7	112.4	302.1
2012	311	191740	119704	191.7	119.7	311.4
2012	312	198842	123703	198.8	123.7	322.5
2012	313	194828	125106	194.8	125.1	319.9
2012	314	195524	126048	195.5	126.0	321.6
2012	315	198544	127603	198.5	127.6	326.1
2012	316	191369	126734	191.4	126.7	318.1
2012	317	176906	122421	176.9	122.4	299.3

PES Refinery

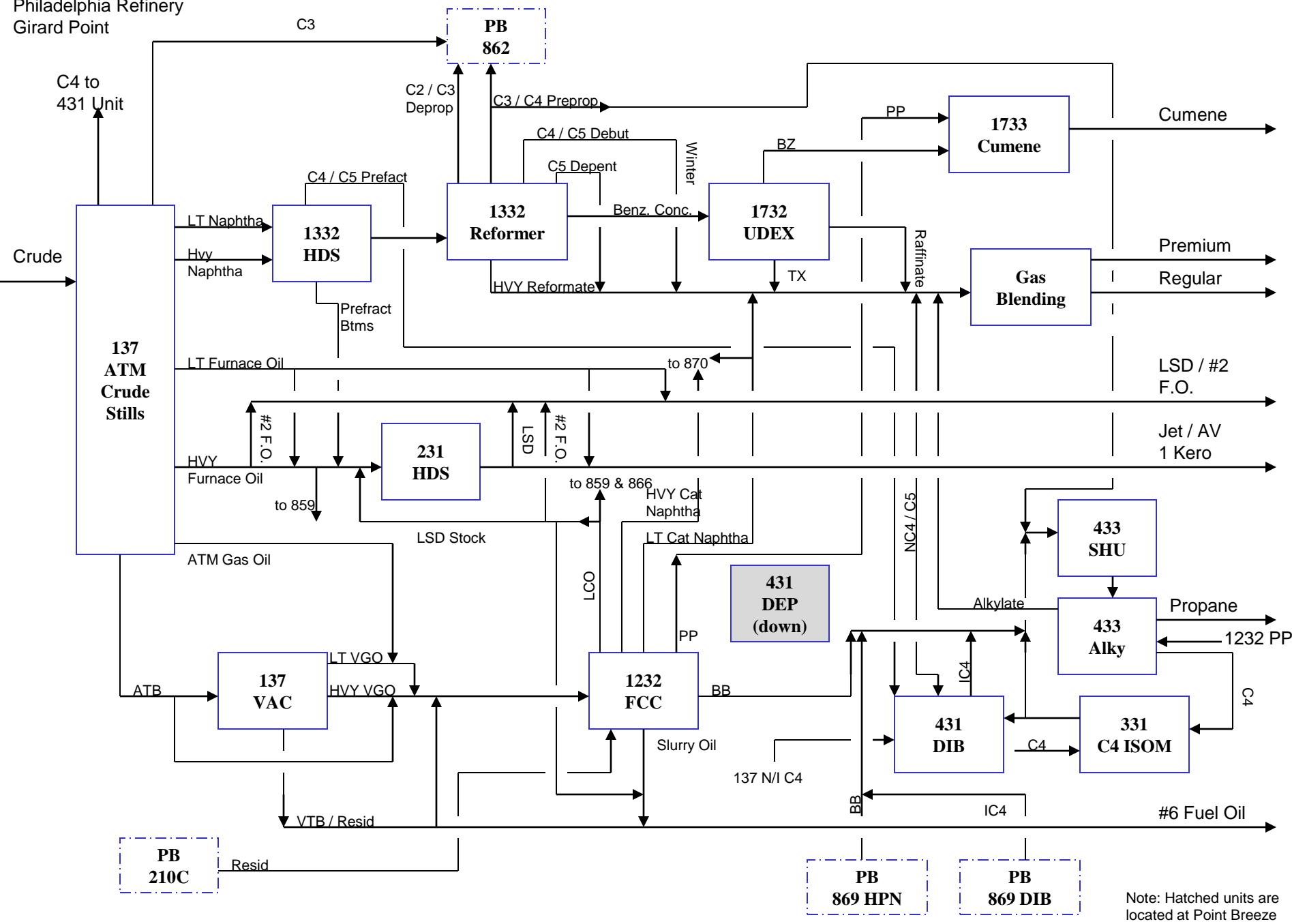
Heater Firing Rate Increase Plan Approval

Refinery Daily Average Crude Throughput

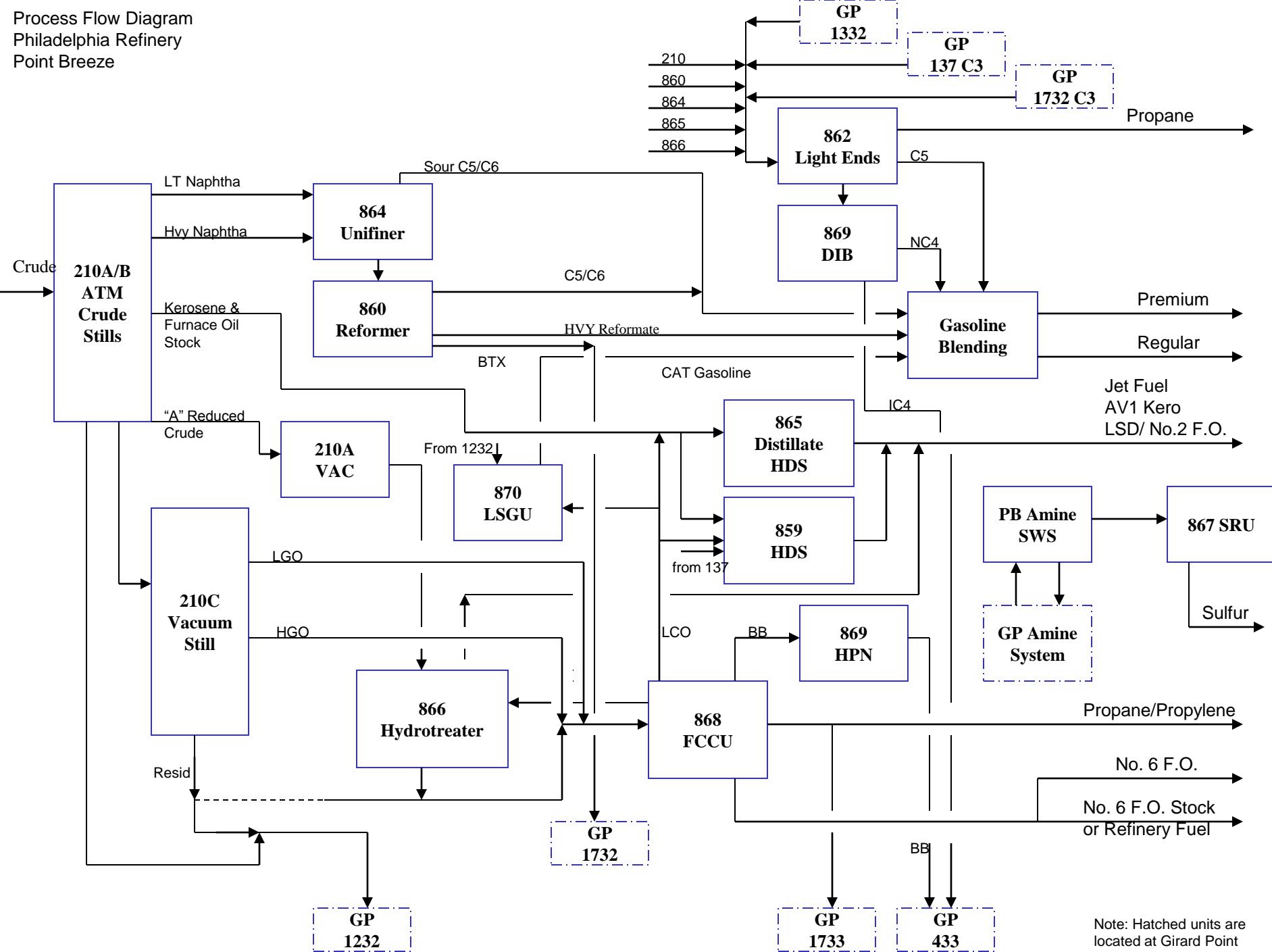
Year	Day	137 Crude BBL	210 Crude BBL	137 Crude MBBL	210 Crude MBBL	Total MBBL
2012	318	170890	121712	170.9	121.7	292.6
2012	319	168861	114043	168.9	114.0	282.9
2012	320	175048	111924	175.0	111.9	287.0
2012	321	182278	94329	182.3	94.3	276.6
2012	322	183914	96789	183.9	96.8	280.7
2012	323	184214	109988	184.2	110.0	294.2
2012	324	186315	112446	186.3	112.4	298.8
2012	325	190099	107663	190.1	107.7	297.8
2012	326	187979	100814	188.0	100.8	288.8
2012	327	189974	101797	190.0	101.8	291.8
2012	328	191856	106347	191.9	106.3	298.2
2012	329	191509	103775	191.5	103.8	295.3
2012	330	186743	105699	186.7	105.7	292.4
2012	331	192985	110026	193.0	110.0	303.0
2012	332	198823	114499	198.8	114.5	313.3
2012	333	197624	107367	197.6	107.4	305.0
2012	334	188719	118972	188.7	119.0	307.7
2012	335	191292	121828	191.3	121.8	313.1
2012	336	193968	122694	194.0	122.7	316.7
2012	337	194624	122469	194.6	122.5	317.1
2012	338	197849	122157	197.8	122.2	320.0
2012	339	197291	123454	197.3	123.5	320.7
2012	340	191298	123886	191.3	123.9	315.2
2012	341	188880	121241	188.9	121.2	310.1
2012	342	192459	115483	192.5	115.5	307.9
2012	343	189397	114951	189.4	115.0	304.3
2012	344	193695	120104	193.7	120.1	313.8
2012	345	195665	126060	195.7	126.1	321.7
2012	346	192048	127441	192.0	127.4	319.5
2012	347	195732	132407	195.7	132.4	328.1
2012	348	190615	132630	190.6	132.6	323.2
2012	349	186214	124071	186.2	124.1	310.3
2012	350	191887	120569	191.9	120.6	312.5
2012	351	192513	121798	192.5	121.8	314.3
2012	352	194307	125304	194.3	125.3	319.6
2012	353	192047	125866	192.0	125.9	317.9
2012	354	183734	118457	183.7	118.5	302.2
2012	355	189729	110129	189.7	110.1	299.9
2012	356	176009	97068	176.0	97.1	273.1
2012	357	153677	89973	153.7	90.0	243.6
2012	358	157042	89116	157.0	89.1	246.2
2012	359	171088	88910	171.1	88.9	260.0
2012	360	179280	90012	179.3	90.0	269.3
2012	361	179242	94654	179.2	94.7	273.9
2012	362	130169	74032	130.2	74.0	204.2
2012	363	0	0	0.0	0.0	0.0
2012	364	0	0	0.0	0.0	0.0
2012	365	0	0	0.0	0.0	0.0
2012	366	0	0	0.0	0.0	0.0

Attachment E
Process Flow Diagrams/Site
Location Map

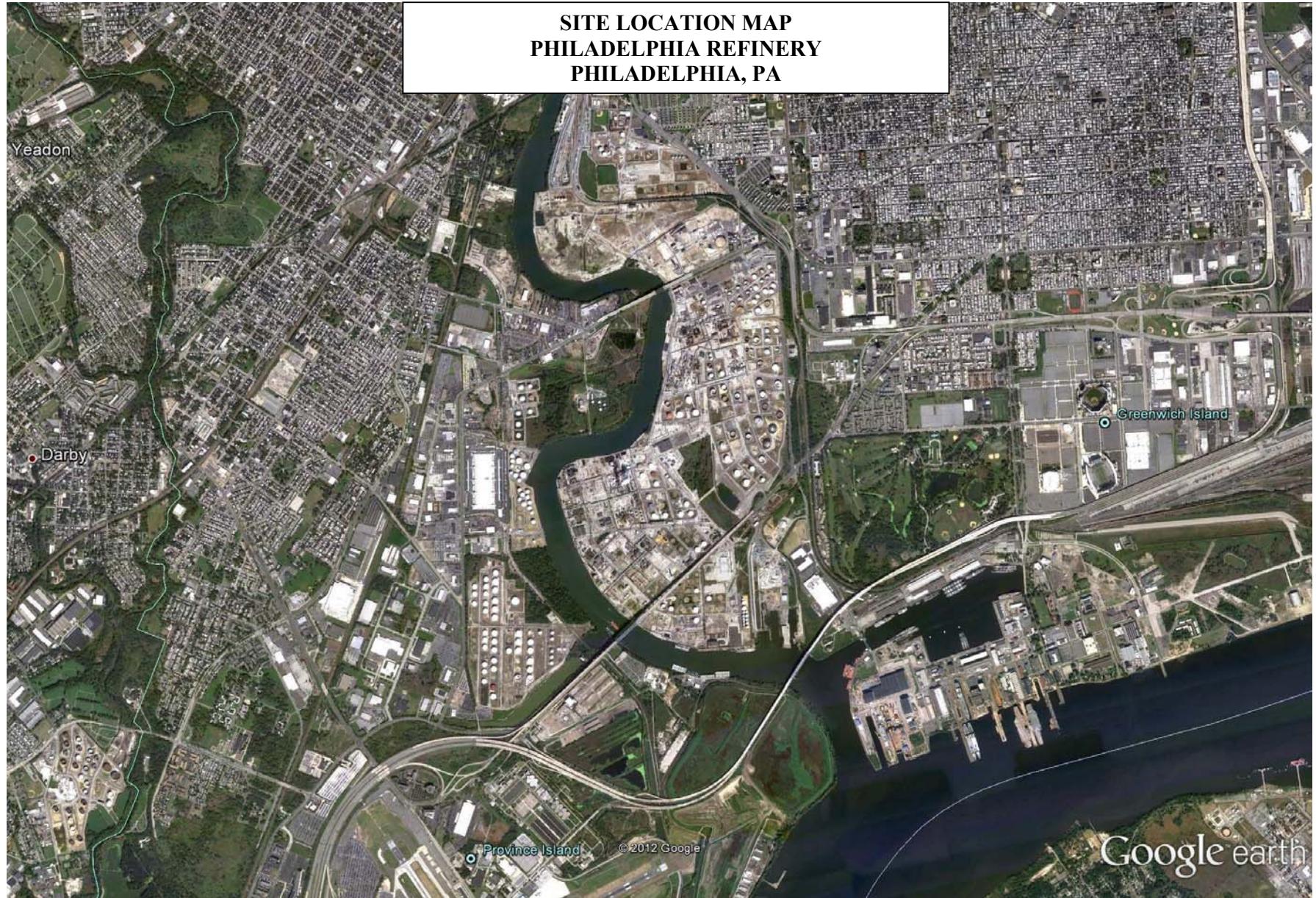
Process Flow Diagram
Philadelphia Refinery
Girard Point



Process Flow Diagram
Philadelphia Refinery
Point Breeze



**SITE LOCATION MAP
PHILADELPHIA REFINERY
PHILADELPHIA, PA**



Attachment F
BAT Cost Effectiveness Analysis

PES Refinery

Heater Firing Rate Increase Plan Approval

BAT Cost Effectiveness Summary

Control Option	Cost Effectiveness (\$/Ton)			
	Unit 865 11H1	Unit 865 11H2	Unit 866 12H1	Unit 868 8H101
ULNB & SCR	NA	34,138	35,966	30,307
SCR	NA	32,467	34,254	28,296
ULNB	3,935	5,381	5,661	5,283
LNB & SNCR	31,417	26,340	27,637	25,808
SNCR	35,874	25,889	27,178	25,331
LNB & FGR	NA	NA	NA	NA

Control Option	Cost Effectiveness (\$/Ton of increase)			
	Unit 865 11H1	Unit 865 11H2	Unit 866 12H1	Unit 868 8H101
ULNB & SCR	NA	110,030	55,690	101,037
SCR	NA	104,643	53,039	94,332
ULNB	10,301	17,344	8,765	17,612
LNB & SNCR	82,237	84,896	42,793	86,037
SNCR	93,904	83,443	42,082	84,447
LNB & FGR	NA	NA	NA	NA

Assumptions for all heaters:

Number of Years	10
Interest Rate (%)	21.83
Annualized Cost factor	0.253

Based on 90% equity cost of the average Carlyle energy funds and 10% after tax debt cost.

Year	Chemical Engineering Cost Index
1999	390.6
2012	582.2
Cost Escalation Factor	1.49

Source	2012 Control Efficiency	Comment
Ultra low-NO _x burners and Selective Catalytic Reduction	ULNB & SCR	96% Combining both removal efficiencies
Selective Catalytic Reduction	SCR	85% Based on Unit 1332 Performance
Ultra low-NO _x burners	ULNB	70 to 73% Based on vendor experience at 0.03 lb/MMBtu
Low-NO _x burners and Selective Non-Catalytic Reduction	LNB & SNCR	53% Combining both removal efficiencies
Selective Non-Catalytic Reduction	SNCR	40% Heater stack temperature below 700°F results in low NO _x removal efficiency
Low-NO _x burners and Flue Gas Recirculation	LNB & FGR	55%

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 865 11H1 BAT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu) ¹	Expected Emissions (TPY) ¹	2012 Control Efficiency (%) ²	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)	Baseline Actual to Future Projected Actual Increases (TPY) ⁴	Incremental Post Control Emissions (TPY)	Incremental NO _x Reduced (TPY)	2012 Incremental Cost Effectiveness (\$/Ton of increase)
ULNB & SCR	699,000	0.100	34.9	96%	1.4	33.5	NA	NA	NA	NA	13.3	0.5	12.8	NA
SCR	699,000	0.100	34.9	85%	5.2	29.6	NA	NA	NA	NA	13.3	2.0	11.3	NA
ULNB	699,000	0.100	34.9	70%	10.5	24.4	308,102	17,886	95,987	3,935	13.3	4.0	9.3	10,301
LNB & SNCR	699,000	0.100	34.9	53%	16.4	18.5	2,091,793	50,466	580,715	31,417	13.3	6.3	7.1	82,237
SNCR	699,000	0.100	34.9	40%	20.9	14.0	1,822,197	38,542	500,451	35,874	13.3	8.0	5.3	93,904
LNB & FGR	699,000	0.100	34.9	55%	15.7	19.2	NA	NA	NA	NA	13.3	6.0	7.3	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E			= (G * ACF ³) + H	= I / F		= K * (1 - D)	= K - L	= I / M	

Notes:

SCR would not physically fit the plot space and there is not adequate pressure to overcome the SCR pressure drop; therefore, SCR is infeasible
FGR installation would require the installation of mechanical draft burners, which is a major re-design of the unit; therefore FGR is infeasible

¹ NO_x emission rate and expected annual emissions based on average results for Quarterly Tuning from 2009 through 2012.

² UNLB Control efficiency based on Current NO_x emission rate and the UNLB emission rate of 0.03 lb/MMBtu

$$\text{Control Efficiency} = ((1 - (0.03 / 0.100)) = 70\%)$$

³ See "BAT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

⁴ Consistent with the baseline actual to future projected emissions increases requested in the Plan Approval application (not including demand growth).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 865 11H2 BAT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)	Baseline Actual to Future Projected Actual Increases (TPY) ³	Incremental Post Control Emissions (TPY)	Incremental NO _x Reduced (TPY)	2012 Incremental Cost Effectiveness (\$/Ton of increase)
ULNB & SCR	500,000	0.113	28.3	96%	1.1	27.1	3,414,798	60,217	925,834	34,138	8.8	0.4	8.4	110,030
SCR	500,000	0.113	28.3	85%	4.2	24.0	2,837,964	60,217	779,613	32,467	8.8	1.3	7.5	104,643
ULNB	500,000	0.113	28.3	73%	7.5	20.8	390,518	12,669	111,662	5,381	8.8	2.3	6.4	17,344
LNB & SNCR	500,000	0.113	28.3	53%	13.3	15.0	1,426,435	32,792	394,378	26,340	8.8	4.1	4.6	84,896
SNCR	500,000	0.113	28.3	40%	17.0	11.3	1,077,651	19,377	292,551	25,889	8.8	5.3	3.5	83,443
LNB & FGR	500,000	0.113	28.3	55%	12.7	15.5	NA	NA	NA	NA	8.8	3.9	4.8	NA
Calculation			= A * B / 2000		= C * (1 - D)	= C - E			= (G * ACF ²) + H	= I / F		= K * (1 - D)	= K - L	= I / M

Notes:

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.² See "BAT Cost Summary" tab for details on the Annualized Cost Factor (ACF).³ Consistent with the baseline actual to future projected emissions increases requested in the Plan Approval application (not including demand growth).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 866 12H1 BAT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)	Baseline Actual to Future Projected Actual Increases (TPY) ³	Incremental Post Control Emissions (TPY)	Incremental NO _x Reduced (TPY)	2012 Incremental Cost Effectiveness (\$/Ton of increase)
ULNB & SCR	456,000	0.113	25.8	96%	1.0	24.7	3,271,708	60,217	889,562	35,966	16.6	0.7	16.0	55,690
SCR	456,000	0.113	25.8	85%	3.9	21.9	2,721,703	60,217	750,142	34,254	16.6	2.5	14.1	53,039
ULNB	456,000	0.113	25.8	73%	6.8	18.9	372,632	12,669	107,128	5,661	16.6	4.4	12.2	8,765
LNB & SNCR	456,000	0.113	25.8	53%	12.1	13.7	1,359,361	32,792	377,376	27,637	16.6	7.8	8.8	42,793
SNCR	456,000	0.113	25.8	40%	15.5	10.3	1,028,464	19,377	280,082	27,178	16.6	10.0	6.7	42,082
LNB & FGR	456,000	0.113	25.8	55%	11.6	14.2	NA	NA	NA	NA	16.6	7.5	9.2	NA
Calculation			= A * B / 2000		= C * (1 - D)	= C - E			= (G * ACF ²) + H	= I / F		= K * (1 - D)	= K - L	= I / M

Notes:

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.² See "BAT Cost Summary" tab for details on the Annualized Cost Factor (ACF).³ Consistent with the baseline actual to future projected emissions increases requested in the Plan Approval application (not including demand growth).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 868 8H101 BAT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)	Baseline Actual to Future Projected Actual Increases (TPY) ³	Incremental Post Control Emissions (TPY)	Incremental NO _x Reduced (TPY)	2012 Incremental Cost Effectiveness (\$/Ton of increase)
ULNB & SCR	480,000	0.113	27.1	96%	1.1	26.0	2,875,227	60,217	789,058	30,307	8.1	0.3	7.8	101,037
SCR	480,000	0.113	27.1	85%	4.1	23.1	2,335,656	60,217	652,283	28,296	8.1	1.2	6.9	94,332
ULNB	480,000	0.113	27.1	73%	7.2	19.9	365,179	12,669	105,239	5,283	8.1	2.2	6.0	17,612
LNB & SNCR	480,000	0.113	27.1	53%	12.7	14.4	1,334,022	32,792	370,953	25,808	8.1	3.8	4.3	86,037
SNCR	480,000	0.113	27.1	40%	16.3	10.8	1,007,597	19,377	274,792	25,331	8.1	4.9	3.3	84,447
LNB & FGR	480,000	0.113	27.1	55%	12.2	14.9	NA	NA	NA	NA	8.1	3.7	4.5	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E			= (G * ACF ²) + H	= I / F		= K * (1 - D)	= K - L	= I / M	

Notes:

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² See "BAT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

³ Consistent with the baseline actual to future projected emissions increases requested in the Plan Approval application (not including demand growth).

Attachment G
RBLC and BAAQMD BACT
Search Results

Summary

NOx

RBLCID	FACILITY NAME	CORPORATE OR COMPANY NAME	FACILITY STATE	DATE DETERMINATION LAST UPDATED	FACILITY DESCRIPTION	PROCESS NAME	PROCESS TYPE	PRIMARY FUEL
PA-0252	SUNOCO, INC. (R&M)	SUNOCO, INC. (R&M)	PA	8/18/2008 PETROLEUM REFINERY	433 H-1 HEATER		11.3	REFINERY FUEL GAS
WA-0324	FERNDALE REFINERY	CONOCOPHILLIPS REFINING COMPANY	WA	1/26/2006 PETROLEUM REFINERY	CGD FEED HEATER (MODEL ID SRC19)		11.31	NATURAL GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	A&B CRUDE HEATERS (1-08 & 2-08); COKER CHARGE HEATER (15-08)		11.39	REFINERY FUEL GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	PLATFORMER HEATER CELLS NO. 1-3 (7A-08, 7B-08, 7C-08); HCU FRACTIONATOR HEATER (13-08)		11.39	REFINERY FUEL GAS
LA-0213	ST. CHARLES REFINERY	VALERO REFINING - NEW ORLEANS, LLC	LA	3/5/2010 PETROLEUM REFINERY	HEATER F-72-703 (7-81)		11.39	REFINERY FUEL GAS
NM-0050	ARTESIA REFINERY	NAVAJO REFINING COMPANY LLC	NM	8/1/2008 PETROLEUM REFINERY	ROSE 2 HOT OIL HEATER		12.3	REFINERY FUEL GAS
OK-0126	SUNOCO INC TULSA REFINERY	SUNOCO INC	OK	4/20/2009 PETROLEUM REFINERY	PROCESS HEATER		12.31	REFINERY FUEL GAS
DE-0020	VALERO DELAWARE CITY REFINERY	VALERO ENERGY CORP	DE	8/2/2010 PETROLEUM REFINERY	CRUDE UNIT VACUUM HEATER 21-H-2		12.39	REFINERY FUEL GAS
*WY-0071	SINCLAIR REFINERY	SINCLAIR WYOMING REFINING COMPANY	WY	10/15/2012 PETROLEUM REFINERY	BSI Heater		13.3	Refinery Fuel Gas
WA-0301	BP CHERRY POINT REFINERY	BRITISH PETROLEUM	WA	5/16/2006 PETROLEUM REFINERY	PROCESS HEATER, IHT		13.31	NATURAL GAS
PA-0256	SUNOCO, INC. (R&M)	SUNOCO, INC. (R&M)	PA	4/24/2006 PETROLEUM REFINERY	1H-5 HEATER		13.39	REFINERY FUEL GAS

PM

RBLCID	FACILITY NAME	CORPORATE OR COMPANY NAME	FACILITY STATE	DATE DETERMINATION LAST UPDATED	FACILITY DESCRIPTION	PROCESS NAME	PROCESS TYPE	PRIMARY FUEL
MT-0030	BILLINGS REFINERY	CONOCOPHILLIPS COMPANY	MT	3/9/2009 PETROLEUM REFINERY	NO. 1 H2 HEATER		11.3	REFINERY FUEL GAS/ PSA GAS
NM-0050	ARTESIA REFINERY	NAVAJO REFINING COMPANY LLC	NM	8/1/2008 PETROLEUM REFINERY	STEAM METHANE REFORMER HEATER		11.3	NATURAL GAS AND REFORMER OFF-GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	PLATFORMER HEATER CELLS NO. 1-3 (7A-08, 7B-08, 7C-08); HCU FRACTIONATOR HEATER (13-08)		11.39	REFINERY FUEL GAS
LA-0213	ST. CHARLES REFINERY	VALERO REFINING - NEW ORLEANS, LLC	LA	3/5/2010 PETROLEUM REFINERY	CPF HEATER H-39-03; H-39-02 (94-28; 94-30)		13.39	REFINERY FUEL GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	THERMAL DRYING UNIT HEATEC HEATER (124-1-91)		13.39	REFINERY FUEL GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	A&B VACUUM TOWER HEATERS (3-08; 4-08)		12.39	REFINERY FUEL GAS
LA-0213	ST. CHARLES REFINERY	VALERO REFINING - NEW ORLEANS, LLC	LA	3/5/2010 PETROLEUM REFINERY	HEATERS (2008-1 - 2008-9)		12.39	PROCESS FUEL GAS

CO

RBLCID	FACILITY NAME	CORPORATE OR COMPANY NAME	FACILITY STATE	DATE DETERMINATION LAST UPDATED	FACILITY DESCRIPTION	PROCESS NAME	PROCESS TYPE	PRIMARY FUEL
NM-0050	ARTESIA REFINERY	NAVAJO REFINING COMPANY LLC	NM	8/1/2008 PETROLEUM REFINERY	STEAM METHANE REFORMER HEATER		11.3	NATURAL GAS AND REFORMER OFF-GAS
LA-0213	ST. CHARLES REFINERY	VALERO REFINING - NEW ORLEANS, LLC	LA	3/5/2010 PETROLEUM REFINERY	HEATER F-72-703 (7-81)		11.39	REFINERY FUEL GAS
MS-0086	CHEVRON PRODUCTS COMPANY, PASCAGOUL CHEVRON PRODUCTS COMPANY	CHEVRON PRODUCTS COMPANY, PASCAGOUL CHEVRON PRODUCTS COMPANY	MS	3/4/2010 PETROLEUM REFINERY	FOUR PLATFORMER FEED/INTERSTAGE HEATER WITH A COMMON STACK		11.39	REFINERY FUEL GAS
NM-0050	ARTESIA REFINERY	NAVAJO REFINING COMPANY LLC	NM	8/1/2008 PETROLEUM REFINERY	ROSE 2 HOT OIL HEATER		12.3	REFINERY FUEL GAS
LA-0238	ALLIANCE REFINERY	CONOCOPHILLIPS COMPANY	LA	5/18/2012 PETROLEUM REFINERY	FCCU FEED HEATER		12.31	REFINERY GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	A B VACUUM TOWER HEATERS (3-08; 4-08)		12.39	REFINERY FUEL GAS
*WY-0071	SINCLAIR REFINERY	SINCLAIR WYOMING REFINING COMPANY	WY	10/15/2012 PETROLEUM REFINERY	S81 Crude Heater		12.39	Refinery Fuel Gas
*WY-0071	SINCLAIR REFINERY	SINCLAIR WYOMING REFINING COMPANY	WY	10/15/2012 PETROLEUM REFINERY	BSI Heater		13.3	Refinery Fuel Gas
NM-0050	ARTESIA REFINERY	NAVAJO REFINING COMPANY LLC	NM	8/1/2008 PETROLEUM REFINERY	SULFUR RECOVERY HOT OIL HEATER		13.3	REFINERY FUEL GAS
WA-0301	BP CHERRY POINT REFINERY	BRITISH PETROLEUM	WA	5/16/2006 PETROLEUM REFINERY	PROCESS HEATER, IHT		13.31	NATURAL GAS
*WY-0071	SINCLAIR REFINERY	SINCLAIR WYOMING REFINING COMPANY	WY	10/15/2012 PETROLEUM REFINERY	Naphtha Splitter Heater		13.39	Refinery Fuel Gas
LA-0213	ST. CHARLES REFINERY	VALERO REFINING - NEW ORLEANS, LLC	LA	3/5/2010 PETROLEUM REFINERY	DHT HEATERS (4-81, 5-81)		13.39	REFINERY FUEL GAS

VOC

RBLCID	FACILITY NAME	CORPORATE OR COMPANY NAME	FACILITY STATE	DATE DETERMINATION LAST UPDATED	FACILITY DESCRIPTION	PROCESS NAME	PROCESS TYPE	PRIMARY FUEL
NM-0050	ARTESIA REFINERY	NAVAJO REFINING COMPANY LLC	NM	8/1/2008 PETROLEUM REFINERY	STEAM METHANE REFORMER HEATER		11.3	NATURAL GAS AND REFORMER OFF-GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	PLATFORMER HEATER CELLS NO. 1-3 (7A-08, 7B-08, & 7C-08) & HCU FRACTIONATOR HEATER (13-08)		11.39	REFINERY FUEL GAS
NM-0050	ARTESIA REFINERY	NAVAJO REFINING COMPANY LLC	NM	8/1/2008 PETROLEUM REFINERY	ROSE 2 HOT OIL HEATER		12.3	REFINERY FUEL GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	A & B VACUUM TOWER HEATERS (3-08 & 4-08)		12.39	REFINERY FUEL GAS
LA-0211	GARYVILLE REFINERY	MARATHON PETROLEUM CO LLC	LA	7/16/2008 PETROLEUM REFINERY	THERMAL DRYING UNIT HEATEC HEATER (124-1-91)		13.39	REFINERY FUEL GAS

Summary

NOx

RBLCID	FACILITY NAME	THROUGHPUT	THROUGHPUT UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	EMISSION LIMIT 1 AVG TIME CONDITION	CASE-BY-CASE BASIS
PA-0252	SUNOCO, INC. (R&M)	260	MMBTU/H	Nitrogen Oxides (NOx)	ULTRALOW LOW NOX BURNER	0.035 LB/MMBTU	HOURLY	BACT-PSD	
WA-0324	FERNDALE REFINERY			Nitrogen Oxides (NOx)	ULTRA LOW NOX BURNERS (ULNB) AND SELECTIVE CATALYTIC REDUCTION (SCR VOLUNTARY)	17 PPMDV	7% O2 OVER A 1-HOUR AVERAGING	BACT-PSD	
LA-0211	GARYVILLE REFINERY	0	0	Nitrogen Oxides (NOx)	ULTRA LOW NOX BURNERS (ULNB) WITHOUT AIR PREHEAT	0.0125 LB/MMBTU	ANNUAL AV	BACT-PSD	
LA-0211	GARYVILLE REFINERY	0	0	Nitrogen Oxides (NOx)	ULTRA LOW NOX BURNERS (ULNB) WITHOUT AIR PREHEAT	0.03 LB/MMBTU	ANNUAL AVERAGE	BACT-PSD	
LA-0213	ST. CHARLES REFINERY	633	MMBTU/H	Nitrogen Oxides (NOx)	LOW NOX BURNERS	0.08 LB/MMBTU	THREE ONE HOUR AVERAGE	BACT-PSD	
NM-0050	ARTESIA REFINERY	120	MMBTU/H	Nitrogen Oxides (NOx)	ULTRA LOW NOX BURNERS	0.03 LB/MMBTU	3-HOUR ROLLING AVERAGE @ 3% O2	BACT-PSD	
OK-0126	SUNOCO INC TULSA REFINERY	44	MMBTU/H	Nitrogen Oxides (NOx)	ULTRA LOW-NOX BURNERS	0.03 LB/MMBTU	3 HOUR AVERAGE	BACT-PSD	
DE-0020	VALEO DELAWARE CITY REFINERY	240	MMBTU/H	Nitrogen Oxides (NOx)	SCR	0.04 LB/MMBTU	3-HR ROLLING AV	RACT	
*WY-0071	SINCLAIR REFINERY	50	MMBtu/hr	Nitrogen Oxides (NOx)	Ultra Low Nox Burners	0.025 LB/MMBTU	3-HR AVERAGE	BACT-PSD	
WA-0301	BP CHERRY POINT REFINERY	13	MMBTU/H	Nitrogen Oxides (NOx)	ULTRA LOW NOX BURNERS	0.1 LB/MMBTU	7% O2, 24 hr ave	BACT-PSD	
PA-0256	SUNOCO, INC. (R&M)	98	MMBTU/H	Nitrogen Oxides (NOx)	ULTRA LOW NOX BURNERS	0.02 LBS/MMBTU	THREE 1-HOUR TESTS	LAER	

PM

RBLCID	FACILITY NAME	THROUGHPUT	THROUGHPUT UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	EMISSION LIMIT 1 AVG TIME CONDITION	CASE-BY-CASE BASIS
MT-0030	BILLINGS REFINERY	266	MMBTU/H	Particulate matter, filterable < 10 µ (PM10)	GOOD COMBUSTION PRACTICES/USE OF CLEAN BURNING FUELS	0.0075 LB/MMBTU		PER ROLLING 12-MONTH TIME PERIOD	BACT-PSD
NM-0050	ARTESIA REFINERY	337	MMBTU/H	Particulate matter, filterable < 10 µ (PM10)	GASEOUS FUEL COMBUSTION ONLY	0.0075 LB/MMBTU	HOURLY		BACT-PSD
LA-0211	GARYVILLE REFINERY			Particulate matter, filterable < 10 µ (PM10)	PROPER DESIGN, OPERATION, AND GOOD ENGINEERING PRACTICES	0.0075 LB/MMBTU	3-HOUR AVERAGE		BACT-PSD
LA-0213	ST. CHARLES REFINERY			Particulate matter, total < 10 µ (TPM10)	PROPER EQUIPMENT DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES, AND USE OF GASEOUS FUELS	0.0074 LB/MMBTU	ANNUAL AVERAGE		BACT-PSD
LA-0211	GARYVILLE REFINERY	9.6	MM BTU/H	Particulate matter, filterable < 10 µ (PM10)		0.05 MAX LB/H			BACT-PSD
LA-0211	GARYVILLE REFINERY	155.2	MMBTU/H EA.	Particulate matter, filterable < 10 µ (PM10)	PROPER DESIGN, OPERATION, AND GOOD ENGINEERING PRACTICES	0.0075 LB/MMBTU	3 HR AV		BACT-PSD
LA-0213	ST. CHARLES REFINERY			Particulate matter, total < 10 µ (TPM10)	COMPLY WITH 40 CFR 60 SUBPARTS NNN AND RRR	0	SEE NOTE		BACT-PSD

CO

RBLCID	FACILITY NAME	THROUGHPUT	THROUGHPUT UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	EMISSION LIMIT 1 AVG TIME CONDITION	CASE-BY-CASE BASIS
NM-0050	ARTESIA REFINERY	337	MMBTU/H	Carbon Monoxide	GASEOUS FUEL COMBUSTION ONLY	0.06 LB/MMBTU		3-HOUR ROLLING AVERAGE	BACT-PSD
LA-0213	ST. CHARLES REFINERY	633	MMBTU/H	Carbon Monoxide	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0.08 LB/MMBTU		THREE ONE HOUR TEST AVERAGE	BACT-PSD
MS-0086	CHEVRON PRODUCTS COMPANY, PASCAGOUL	850	MMBTU/H	Carbon Monoxide		132.6 LB/H		3-HR AVERAGE	BACT-PSD
NM-0050	ARTESIA REFINERY	120	MMBTU/H	Carbon Monoxide	GASEOUS FUEL COMBUSTION ONLY EQUIPPED WITH VORTOMETRIC HIGH INTENSITY COMBUSTION UNIT	0.06 LB/MMBTU		3-HOUR ROLLING AVERAGE @ 3% O2	BACT-PSD
LA-0238	ALLIANCE REFINERY	181.7	MMBTU/H	Carbon Monoxide	PROPER DESIGN, OPERATION, AND GOOD ENGINEERING PRACTICES	0.55 LB/H		HOURLY MAXIMUM	BACT-PSD
LA-0211	GARYVILLE REFINERY	155.2	MMBTU/H EA.	Carbon Monoxide	PROPER DESIGN, OPERATION, AND GOOD ENGINEERING PRACTICES	0.04 LB/MMBTU		30 DAY ROLLING AVERAGE	BACT-PSD
*WY-0071	SINCLAIR REFINERY	233	MMBtu/hr	Carbon Monoxide	Good Combustion Practices	0.04 LB/MMBTU		3-HR AVERAGE	BACT-PSD
*WY-0071	SINCLAIR REFINERY	50	MMBtu/hr	Carbon Monoxide	Ultra Low NOx burners/good combustion practices	0.04 LB/MMBTU		3-HR AVERAGE	BACT-PSD
NM-0050	ARTESIA REFINERY	9.6	MMBTU	Carbon Monoxide	GOOD COMBUSTION PRACTICES	0		SEE NOTE	BACT-PSD
WA-0301	BP CHERRY POINT REFINERY	13	MMBTU/H	Carbon Monoxide	GOOD COMBUSTION PRACTICES	70 PPM		7% O2, 24 hr ave	BACT-PSD
*WY-0071	SINCLAIR REFINERY	46.3	MMBtu/hr	Carbon Monoxide	Good Combustion Practices	0.04 LB/MMBTU		3-HR AVERAGE	BACT-PSD
LA-0213	ST. CHARLES REFINERY	70	MMBTU/H EA	Carbon Monoxide	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES	0.08 LB/MMBTU		THREE ONE HOUR TEST AVERAGE	BACT-PSD

VOC

RBLCID	FACILITY NAME	THROUGHPUT	THROUGHPUT UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT 1	EMISSION LIMIT 1 UNIT	EMISSION LIMIT 1 AVG TIME CONDITION	CASE-BY-CASE BASIS
NM-0050	ARTESIA REFINERY	337	MMBTU/H	Volatile Organic Compounds (VOC)	GASEOUS FUEL COMBUSTION ONLY	0.005 LB/MMBTU		HOURLY	BACT-PSD
LA-0211	GARYVILLE REFINERY			Volatile Organic Compounds (VOC)	PROPER DESIGN, OPERATION, AND GOOD ENGINEERING PRACTICES	0.0015 LB/MMBTU		3-HOUR AVERAGE	BACT-PSD
NM-0050	ARTESIA REFINERY	120	MMBTU/H	Volatile Organic Compounds (VOC)	GASEOUS FUEL COMBUSTION ONLY.	0.005 LB/MMBTU		HOURLY	BACT-PSD
LA-0211	GARYVILLE REFINERY	155.2	MMBTU/H EA.	Volatile Organic Compounds (VOC)	PROPER DESIGN, OPERATION, AND GOOD ENGINEERING PRACTICES	0.0015 LB/MMBTU		2 HOUR AVERAGE	BACT-PSD
LA-0211	GARYVILLE REFINERY	9.6	MM BTU/H	Volatile Organic Compounds (VOC)		0.15 MAX LB/H			BACT-PSD

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source Category

Source:	Heater - Refinery Process, Forced Draft	Revision:	3
		Document #:	94.2.1
Class:	5 MMBtu/hr to <50 MMBtu/hr Heat Input	Date:	08/12/94

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. n/d 2. n/s	1. n/d 2. Good Combustion Practice ^a
NOx	1. 10 ppmv @ 3% O ₂ Dry ^{a,b,c,e} 2. 20 ppmv @ 3% O ₂ Dry ^{a,b,e}	1. Selective Catalytic Reduction (SCR) + Low NO _x Burners ^{a,b,c} 2. Low NO _x Burners; + Flue Gas Recirculation; or Low NO _x Burners + Selective Non-Catalytic Reduction (SNCR); or Selective Catalytic Reduction(SCR) ^{a,d}
SO ₂	1. Natural Gas or Treated Refinery Gas Fuel w/ ≤50 ppmv Hydrogen Sulfide and ≤100 ppmv Total Reduced Sulfur ^a 2. Natural Gas or Treated Refinery Gas Fuel w/ ≤100 ppmv Total Reduced Sulfur ^a	1. Fuel Selection ^a 2. Fuel Selection ^a
CO	1. n/d 2. 50 ppmv @ 3% O ₂ Dry ^{a,f}	1. n/d 2. Good Combustion Practice ^a
PM ₁₀	1. n/d 2. Natural Gas or Treated Refinery Gas Fuel ^{a,b}	1. n/d 2. Fuel Selection ^{a,b}
NPOC	1. n/a 2. n/a	1. n/a 2. n/a

References

- a. BAAQMD
- b. BAAQMD A #30783
- c. BAAQMD A #3318
- d. BAAQMD A #8407
- e. NO_x determination by BAAQMD Source Test Method ST-13A or B (average of three 30-minute sampling runs); or Continuous Emission Monitor (3-hour average); or BAAQMD approved equivalent.
- f. CO determination by BAAQMD Source Test Method ST-6 (average of three 30 minute sampling runs); or Continuous Emission Monitor (3-hour average); or BAAQMD approved equivalent.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source Category

Source:	<i>Heater - Refinery Process, Natural or Induced Draft</i>	Revision:	3
		Document #:	94.1.1
Class:	<i>5 MMBtu/hr to <50 MMBtu/hr Heat Input</i>	Date:	08/12/94

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. n/d 2. n/s	1. n/d 2. Good Combustion Practice ^a
NOx	1. 10 ppmv @ 3% O ₂ Dry ^{a,b,c,e} 2. 25 ppmv @ 3% O ₂ Dry ^{a,b,e}	1. Selective Catalytic Reduction (SCR) + Low NO _x Burners ^{a,b,c} 2. Low NO _x Burners; or Low NO _x Burners + Selective Non-Catalytic Reduction (SNCR) ^{a,d}
SO ₂	1. Natural Gas or Treated Refinery Gas Fuel w/ ≤50 ppmv Hydrogen Sulfide and ≤100 ppmv Total Reduced Sulfur ^a 2. Natural Gas or Treated Refinery Gas Fuel w/ ≤100 ppmv Total Reduced Sulfur ^a	1. Fuel Selection ^a 2. Fuel Selection ^a
CO	1. n/d 2. 50 ppmv @ 3% O ₂ Dry ^{a,f}	1. n/d 2. Good Combustion Practice ^a
PM ₁₀	1. n/d 2. Natural Gas or Treated Refinery Gas Fuel ^{a,b}	1. n/d 2. Fuel Selection ^{a,b}
NPOC	1. n/a 2. n/a	1. n/a 2. n/a

References

- a. BAAQMD
- b. BAAQMD A #30783
- c. BAAQMD A #3318
- d. BAAQMD A #8407
- e. NO_x determination by BAAQMD Source Test Method ST-13A or B (average of three 30-minute sampling runs); or Continuous Emission Monitor (3-hour average); or BAAQMD approved equivalent.
- f. CO determination by BAAQMD Source Test Method ST-6 (average of three 30 minute sampling runs); or Continuous Emission Monitor (3-hour average); or BAAQMD approved equivalent.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source Category

Source:	Heater - Refinery Process	Revision:	4
Class:	<i>>50 MMBtu/hr Heat Input</i>	Document #:	94.3.1
		Date:	1/14/08

Determination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. n/d 2. n/s	1. n/d 2. Good Combustion Practice ^a
NOx	1. n/d 2. 5 ppmv @ 3% O ₂ Dry ^{c,d,e}	1. n/d 2. Selective Catalytic Reduction (SCR) + Low NO _x Burners ^{c,d}
SO ₂	1. Natural Gas or Treated Refinery Gas Fuel w/ ≤50 ppmv Hydrogen Sulfide and ≤100 ppmv Total Reduced Sulfur ^a 2. Natural Gas or Treated Refinery Gas Fuel w/ ≤100 ppmv Total Reduced Sulfur ^a	1. Fuel Selection ^a 2. Fuel Selection ^a
CO	1. n/d 2. 10 ppmv @ 3% O ₂ Dry ^{c,d,f}	1. n/d 2. Good Combustion Practice in Conjunction w/ Selective Catalytic Reduction (SCR) System ^{c,d}
PM ₁₀	1. n/d 2. Natural Gas or Treated Refinery Gas Fuel ^{a,b}	1. n/d 2. Fuel Selection ^{a,b}
NPOC	1. n/a 2. n/a	1. n/a 2. n/a

References

- a. BAAQMD A #8407
- b. BAAQMD A #30783
- c. ARB BACT Clearinghouse, based on several South Coast AQMD projects. Recommend ammonia slip limit of 10 ppmv at 3% O₂.
- d. Authority to Construct issued for BAAQMD applications 13424 & 13678 for CononcoPhillips Clean Fuels Expansion Project. For 85 MM BTU/hr furnace, the CO limit only applies at firing rates greater than 30 MM BTU/hr.
- e. NO_x determination by Continuous Emission Monitor (3-hour average); or BAAQMD approved equivalent.
- f. CO determination by Continuous Emission Monitor (3-hour average); or BAAQMD approved equivalent.

Attachment H
CO Cost Effectiveness Analysis

PES Refinery

Heater Firing Rate Increase Plan Approval

CO Cost Effectiveness Summary

Assumptions for all heaters:

Number of Years	10
Interest Rate (%)	21.83
Annualized Cost factor	0.253

Based on 90% equity cost of the average Carlyle energy funds and 10% after tax debt cost.

Year	Chemical Engineering Cost Index
2002	395.6
2012	582.2
Cost Escalation Factor	1.47

Oxidation Catalyst Costs ¹	EPA, \$/cfm (2002 Basis)	EPA, \$/cfm (2012 Basis)
Capital Cost for Oxidation Catalyst	35.0	51.5
O&M Cost for Oxidation Catalyst	6.0	8.8

¹ Based on EPA Air Pollution Control Technology Fact Sheet for Regenerative Incinerator (EPA-452/F-03-021). Capital costs range from \$35 to \$140 per cfm and O&M costs range from \$6 to \$20 per cfm.

A Heater	B Proposed Hourly Firing Limit (MMBtu/Hr) ¹	C Projected Actual CO Emissions (TPY) ^{2,3}	D Stack Flow (ACFM) ⁴	E Stack Temp (°F)	F Stack Flow (SCFM)	G Capital Cost (\$)	H O&M Cost (\$)	I Annualized Cost (\$)	J Cost Effectiveness (\$/Ton)
Unit 865-11H1	87.3	28.48	32,461	600.8	16,157	832,236	142,669	353,632	12,418
Unit 865-11H2	64.2	20.37	---	---	9,320	480,049	82,294	203,982	10,014
Unit 210-H201	254.0	88.49	117,282	474.8	66,244	3,412,169	584,943	1,449,894	16,385
Unit 866-12H1	61.2	18.58	---	---	8,884	457,617	78,449	194,450	10,467
Unit 868-8H101	60.0	18.9	18,918	500.0	10,405	535,947	91,877	227,734	12,053
Calculation					= C / ((460 + D)/(460+68))			= (F * ACF ⁵) + G	= H / B

Notes:

Trace levels of SO₂ will result in deactivation of the catalyst by sulfur-containing compounds. Oxidation catalysts are not typically installed on refinery fuel gas fired process heaters.

Oxidation catalysts typically operate at 650°F to 1,000°F. As shown above, none of the heaters in this analysis achieve stack temperatures within the typical operating range.

¹ Consistent with the proposed hourly firing rate limits requested in the Plan Approval application.

² Consistent with the future projected actual emissions in the Plan Approval application.

³ Conservatively assumed that an Oxidation Catalyst would provide 100% reduction in CO emissions from the heaters.

⁴ Stack flows (SCFM) for Unit 865-11H2 and Unit 866-12H1 Heaters were estimated using EPA Method 19 factor of 8,710 dscf/MMBtu

⁵ See for details above on the Annualized Cost Factor (ACF).

Attachment I
RACT Cost Effectiveness
Analysis

PES Refinery

Heater Firing Rate Increase Plan Approval

RACT Cost Effectiveness Summary

Control Option	Cost Effectiveness (\$/Ton)							
	Unit 137 F-1	Unit 231 B101	Unit 865 11H1	Unit 865 11H2	Unit 210 H101	Unit 210 H201	Unit 866 12H1	Unit 868 8H101
ULNB & SCR	20,518	14,195	NA	34,138	12,674	28,442	35,966	30,307
SCR	12,450	12,007	NA	32,467	12,071	27,088	34,254	28,296
ULNB	12,411	3,820	3,309	5,381	4,471	NA	5,661	5,283
LNB & SNCR	17,477	13,803	27,744	26,340	14,986	33,631	27,637	25,808
SNCR	12,600	10,985	31,679	25,889	NA	NA	27,178	25,331
LNB & FGR	NA	NA	NA	NA	NA	NA	NA	NA

Assumptions for all heaters:

Number of Years	10
Interest Rate (%)	21.83
Annualized Cost factor	0.253

Based on 90% equity cost of the average Carlyle energy funds and 10% after tax debt cost.

Year	Chemical Engineering Cost Index
1999	390.6
2012	582.2
Cost Escalation Factor	1.49

Source		2012 Control Efficiency	Comment
Ultra low-NO _x burners and Selective Catalytic Reduction	ULNB & SCR	96%	Combining both removal efficiencies
Selective Catalytic Reduction	SCR	85%	Based on Unit 1332 Performance
Ultra low-NO _x burners	ULNB	66 to 76%	Based on vendor experience at 0.03 lb/MMBtu
Low-NO _x burners and Selective Non-Catalytic Reduction	LNB & SNCR	53%	Combining both removal efficiencies
Selective Non-Catalytic Reduction	SNCR	40%	Heater stack temperature below 700°F results in low NO _x removal efficiency
Low-NO _x burners and Flue Gas Recirculation	LNB & FGR	55%	

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 137 F-1 RACT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J	K
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Incremental Shutdown Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)
ULNB & SCR	3,767,000	0.123	231.7	96%	9.3	222.4	9,877,706	569,985	5,875,838	4,563,350	20,518
SCR	3,767,000	0.123	231.7	85%	34.8	196.9	7,663,122	509,084	NA	2,451,608	12,450
ULNB	3,767,000	0.123	231.7	76%	56.5	175.2	2,435,793	66,984	5,875,838	2,173,899	12,411
LNB & SNCR	3,767,000	0.123	231.7	53%	108.9	122.8	1,531,802	268,128	5,875,838	2,145,890	17,477
SNCR	3,767,000	0.123	231.7	40%	139.0	92.7	3,788,800	207,227	NA	1,167,649	12,600
LNB & FGR	3,767,000	0.123	231.7	55%	104.3	127.4	NA	NA	NA	NA	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E					= ((G+I) * ACF ²) + H	= J / F

Notes:

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² See "RACT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 231 B101 RACT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)
ULNB & SCR	856,000	0.122	52.2	96%	2.1	50.1	2,510,048	75,291	711,563	14,195
SCR	856,000	0.122	52.2	85%	7.8	44.4	2,039,041	16,040	532,916	12,007
ULNB	856,000	0.122	52.2	75%	12.8	39.4	530,628	15,919	150,428	3,820
LNB & SNCR	856,000	0.122	52.2	53%	24.5	27.7	1,347,437	40,429	381,991	13,803
SNCR	856,000	0.122	52.2	40%	31.3	20.9	809,356	24,275	229,438	10,985
LNB & FGR	856,000	0.122	52.2	55%	23.5	28.7	NA	NA	NA	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E				= (G * ACF ²) + H	= I / F

Notes:

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² See "RACT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 865 11H1 RACT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)
ULNB & SCR	699,000	0.113	39.5	96%	1.6	37.9	NA	NA	NA	NA
SCR	699,000	0.113	39.5	85%	5.9	33.6	NA	NA	NA	NA
ULNB	699,000	0.113	39.5	73%	10.5	29.0	308,102	17,886	95,987	3,309
LNB & SNCR	699,000	0.113	39.5	53%	18.6	20.9	2,091,793	50,466	580,715	27,744
SNCR	699,000	0.113	39.5	40%	23.7	15.8	1,822,197	38,542	500,451	31,679
LNB & FGR	699,000	0.113	39.5	55%	17.8	21.7	NA	NA	NA	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E				= (G * ACF ²) + H	= I / F

Notes:

SCR would not physically fit the plot space and there is not adequate pressure to overcome the SCR pressure drop; therefore, SCR is infeasible
FGR installation would require the installation of mechanical draft burners, which is a major re-design of the unit; therefore FGR is infeasible

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² See "RACT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 865 11H2 RACT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)
ULNB & SCR	500,000	0.113	28.3	96%	1.1	27.1	3,414,798	60,217	925,834	34,138
SCR	500,000	0.113	28.3	85%	4.2	24.0	2,837,964	60,217	779,613	32,467
ULNB	500,000	0.113	28.3	73%	7.5	20.8	390,518	12,669	111,662	5,381
LNB & SNCR	500,000	0.113	28.3	53%	13.3	15.0	1,426,435	32,792	394,378	26,340
SNCR	500,000	0.113	28.3	40%	17.0	11.3	1,077,651	19,377	292,551	25,889
LNB & FGR	500,000	0.113	28.3	55%	12.7	15.5	NA	NA	NA	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E				= (G * ACF ²) + H	= I / F

Notes:

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² See "RACT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 210 H101 RACT Cost Effectiveness Summary

Control Option	A New Firing Maximum (MMBtu/year)	B Current Emission Rate (lb/MMBtu)	C Future Projected Actual Emissions (TPY) ¹	D 2012 Control Efficiency (%) ²	E Maximum Potential Post Control Emissions (TPY)	F Potential NO _x Reduced (TPY)	G 2012 Total Capital Cost (\$)	H 2012 O&M Cost (\$)	I 2012 Annualized Cost (\$)	J 2012 Cost Effectiveness (\$/Ton)
ULNB & SCR	1,643,000	0.089	73.1	96%	2.9	70.2	3,271,708	60,217	889,562	12,674
SCR	1,643,000	0.089	73.1	85%	11.0	62.1	2,721,703	60,217	750,142	12,071
ULNB	1,643,000	0.089	73.1	66%	24.6	48.5	764,365	22,931	216,690	4,471
LNB & SNCR	1,643,000	0.089	73.1	53%	34.4	38.8	2,091,793	50,466	580,715	14,986
SNCR	1,643,000	0.089	73.1	40%	43.9	29.2	NA	NA	NA	NA
LNB & FGR	1,643,000	0.089	73.1	55%	32.9	40.2	NA	NA	NA	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E				= (G * ACF ³) + H	= I / F

Notes:

FGR would not physically fit the plot space; therefore, it is infeasible.

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² Current generation UNLB is considered to be 0.03 lb/MMBtu, which represents a 66% reduction from 0.089 lb/MMBtu.

³ See "RACT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 210 H201 RACT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)
ULNB & SCR	2,172,000	0.03	32.6	96%	1.3	31.3	3,271,708	60,217	889,562	28,442
SCR	2,172,000	0.03	32.6	85%	4.9	27.7	2,721,703	60,217	750,142	27,088
ULNB	2,172,000	0.03	32.6	0%	32.6	0.0	NA	NA	NA	NA
LNB & SNCR	2,172,000	0.03	32.6	53%	15.3	17.3	2,091,793	50,466	580,715	33,631
SNCR	2,172,000	0.03	32.6	40%	19.5	13.0	NA	NA	NA	NA
LNB & FGR	2,172,000	0.03	32.6	55%	14.7	17.9	NA	NA	NA	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E				= (G * ACF ²) + H	= I / F

Notes:

SCR would not physically fit the plot space and there is not adequate pressure to overcome the SCR pressure drop; therefore, SCR is infeasible.

FGR installation would require the installation of mechanical draft burners, which is a major re-design of the unit; therefore FGR is infeasible.

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² See "RACT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 866 12H1 RACT Cost Effectiveness Summary

Control Option	A New Firing Maximum (MMBtu/year)	B Current Emission Rate (lb/MMBtu)	C Future Projected Actual Emissions (TPY) ¹	D 2012 Control Efficiency (%)	E Maximum Potential Post Control Emissions (TPY)	F Potential NO _x Reduced (TPY)	G 2012 Total Capital Cost (\$)	H 2012 O&M Cost (\$)	I 2012 Annualized Cost (\$)	J 2012 Cost Effectiveness (\$/Ton)
ULNB & SCR	456,000	0.113	25.8	96%	1.0	24.7	3,271,708	60,217	889,562	35,966
SCR	456,000	0.113	25.8	85%	3.9	21.9	2,721,703	60,217	750,142	34,254
ULNB	456,000	0.113	25.8	73%	6.8	18.9	372,632	12,669	107,128	5,661
LNB & SNCR	456,000	0.113	25.8	53%	12.1	13.7	1,359,361	32,792	377,376	27,637
SNCR	456,000	0.113	25.8	40%	15.5	10.3	1,028,464	19,377	280,082	27,178
LNB & FGR	456,000	0.113	25.8	55%	11.6	14.2	NA	NA	NA	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E				= (G * ACF ²) + H	= I / F

Notes:

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² See "RACT Cost Summary" tab for details on the Annualized Cost Factor (ACF).

PES Refinery

Heater Firing Rate Increase Plan Approval

Unit 868 8H101 RACT Cost Effectiveness Summary

	A	B	C	D	E	F	G	H	I	J
Control Option	New Firing Maximum (MMBtu/year)	Current Emission Rate (lb/MMBtu)	Future Projected Actual Emissions (TPY) ¹	2012 Control Efficiency (%)	Maximum Potential Post Control Emissions (TPY)	Potential NO _x Reduced (TPY)	2012 Total Capital Cost (\$)	2012 O&M Cost (\$)	2012 Annualized Cost (\$)	2012 Cost Effectiveness (\$/Ton)
ULNB & SCR	480,000	0.113	27.1	96%	1.1	26.0	2,875,227	60,217	789,058	30,307
SCR	480,000	0.113	27.1	85%	4.1	23.1	2,335,656	60,217	652,283	28,296
ULNB	480,000	0.113	27.1	73%	7.2	19.9	365,179	12,669	105,239	5,283
LNB & SNCR	480,000	0.113	27.1	53%	12.7	14.4	1,334,022	32,792	370,953	25,808
SNCR	480,000	0.113	27.1	40%	16.3	10.8	1,007,597	19,377	274,792	25,331
LNB & FGR	480,000	0.113	27.1	55%	12.2	14.9	NA	NA	NA	NA
Calculation		= A * B / 2000		= C * (1 - D)	= C - E				= (G * ACF ²) + H	= I / F

Notes:

¹ Consistent with the future projected actual emissions requested in the Plan Approval application.

² See "RACT Cost Summary" tab for details on the Annualized Cost Factor (ACF).